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(54) Title: DRAW-BASED EDITOR FOR WEB PAGES (57) Abstract <p>A method and apparatus for a draw-based Web page editor in which the user uses a "drag and drop" interface to add, delete, and move display elements to define the layout of a Web page. The present invention automatically generates an initial layout for each page. This initial layout contains display elements that represent the links between pages of the site. After the user has defined the layout of the Web page, the user "publishes" the page. The publish function automatically generates HTML for the page in accordance with the display elements of the page, yielding a true WYSIWYG page.</p>			

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DRAW-BASED EDITOR FOR WEB PAGES

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FIELD OF THE INVENTION

This application relates to the World Wide Web and, in particular, to a method and apparatus for easily generating web pages on a "What You See is What You Get" (WYSIWYG) basis.

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BACKGROUND OF THE INVENTION

The past several years have seen an explosive growth of the World Wide Web ("the Web"). The Web is built around a network of "server" computers, which exchange requests and data with each other using the hypertext transfer protocol ("http"). A human designer designs the layout of a Web page, which is then specified using HTML ("Hypertext Markup Language"). Several versions of HTML are currently in existence. Examples include HTML versions 2.0 and 3.0, as specified by the WWW Consortium of MIT. Netscape Communications Corp. has specified additional HTML features that extend HTML forms and tables.

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A user views a Web page using one of a number of commercially available "browser" programs. The browser submits an appropriate http request to establish a communications link with a Web server of the network. A typical http request references a Web page by its unique Uniform Resource Locator ("URL"). A URL identifies the Web server hosting that Web page; so that an http request for access to the Web page can be routed to the appropriate Web server for handling. Web pages can also be linked graphically to each other.

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The HTML to describe a Web page is often created by hand by a human being. If the design of the page changes, the corresponding HTML must be

5 rewritten, which is an exacting process. Although several conventional HTML editors exist, these editors only allow the user to specify certain elements of a page and frequently still require the user to physically enter HTML code. Conventional HTML editors allow the user to specify the page content and general layout, but do not provide the user with "What You See Is What You Get" (WYSIWYG) capability.

10 Thus, the pages generated by conventional HTML editors look different when viewed by different browsers.

A Web "site" consists of a "homepage" and several other related pages. Each page has corresponding HTML that describes the appearance and function of the page. For example, the HTML for the homepage usually contains links to one or more of the other pages and the other pages often contain respective links back to the homepage. When the user clicks on a link of the displayed homepage, the browser requests and displays the linked-to page. Each link must be designed and coded into the HTML for the page. Thus, for example, when a human designer decides to remove a link between the homepage and another page, the HTML for the homepage must be changed to reflect the removed link. This process is exacting and requires that the user manually change the link. Moreover, if the linked-to page has another link back to the homepage, that link may also need to be changed.

25 It is a common problem that not all browsers interpret HTML code in the same way. For example, some browsers will automatically center a page title, while others may left justify a page title. Similarly, horizontal and vertical spacing may vary between browsers made by different companies.

It is usually desirable to have a consistent style for all pages of a site.

5 When the user hand codes the HTML for each page of a site, it is difficult for the user to remember to use a consistent style. In addition, if the user decides to change the style of a site, each page must be changed individually.

SUMMARY OF THE INVENTION

10 The present invention overcomes the problems and disadvantages of the prior art by using a drag and drop interface to allow a user to easily design a Web page. The user moves display elements to define the appearance of a web page. When the user clicks/selects a "publish" button, HTML code is automatically generated. A preferred embodiment of the invention generates an HTML table in accordance with the display elements. The number and size of cells in the HTML 15 table reflects the number and placement of display elements on the page, yielding a true WYSIWYG Web page. Because the generated HTML code is in the form of a table, the HTML will cause most browsers to display a page that has substantially the same layout, proportionality, coloring, and spacing as the layout of the page displayed by the page draw editor software.

20 Initially, the present invention automatically generates a layout that is used for each page unless overridden by the user. Each page is initially generated in accordance with "style" parameters chosen by the user.

25 In accordance with the purpose of the invention, as embodied and broadly described herein the invention is a method of allowing a user to define a World Wide Web page comprising the steps, performed by a data processing system, of displaying a plurality of page display elements on a display device, the display elements forming a page layout on the display device; receiving an indication that the user wants to add a new display element to the page at a first position on the

5 page; adding a new draw data structure in a memory of the data processing system for the new display element to a plurality of other draw data structures, the draw data structures corresponding to the plurality of page display elements, where the new draw data structure includes data representing the first position; and generating HTML that substantially reflects the displayed page layout on a pixel by pixel basis in accordance with the draw data structures.

10 Advantages of the invention will be set forth in part in the description which follows and in part will be obvious from the description or may be learned by practice of the invention. The advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims and equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are in and constitute a part of this specification, illustrate several embodiments of the invention and, together with the description, serve to explain the principles of the invention.

20 Fig. 1 is a block diagram of a computer system in accordance with a preferred embodiment of the present invention.

Fig. 2 is a block diagram showing input and output to and from page draw editor software of Fig. 1.

25 Fig. 3 shows an example of display view before the user has created any display elements on the page.

Fig. 4 shows the display of Fig. 3, including a banner, navigator buttons, and text buttons automatically created by a preferred embodiment of the present invention.

5 Fig. 5 shows the display of Fig. 4 after the user has dragged and dropped
an image and some text into the layout.

Fig. 6 shows a preview display of the layout of Fig. 5.

Fig. 7 shows the display of Fig. 5 after the user has dragged and dropped
the text to a different location on the page.

10 Fig. 8 shows a preview display of the layout of Fig. 7.

Fig. 9(a) shows a detail of a tool window of Fig. 3.

Fig. 9(b) shows a portion of the tool window displayed in connection with
an Image tool.

15 Fig. 9(c) shows a portion of the tool window displayed in connection with a
Forms tool.

Fig. 9(d) shows a portion of the tool window displayed in connection with a
Draw tool.

Fig. 10(a) shows a Page tab in a Properties window of Fig. 3.

Fig. 10(b) shows a Layout tab in the Properties window of Fig. 3.

20 Fig. 10(c) shows a Rectangle tab in the Properties window of Fig. 3.

Fig. 10(d) shows a Text tab in the Properties window of Fig. 3.

Fig. 10(e) shows an ActiveX tab in the Properties window of Fig. 3.

Fig. 10(f) shows a Java APPLET tab in the Properties window of Fig. 3.

Fig. 10(g) shows a Shockwave tab in the Properties window of Fig. 3.

25 Fig. 10(h) shows a Table tab in the Properties window of Fig. 3.

Fig. 11(a) shows a first pull-down menu.

Fig. 11(b) shows a second pull-down menu.

Fig. 11(c) shows a third pull-down menu.

5 Fig. 12 is a flow chart showing steps performed by the page draw editor software to define a page layout.

Fig. 13 is an example showing an initial internal representation stored in a memory of objects automatically generated on the page by the page draw editor software for the layout of Fig. 4.

10 Fig. 14 is an example showing the internal representation after some display elements have been added by the user.

Fig. 15 is an example showing the internal representation after a display element has been moved by the user.

Fig. 16(a) is an example of a draw object for a page banner.

15 Fig. 16(b) is an example of a first draw object for a navigator button.

Fig. 16(c) is an example of a first draw object for a navigator button.

Fig. 16(d) is an example of a draw object for a text button.

Fig. 17 shows an example of a display used to allow the user to publish the pages of a site.

20 Fig. 18 shows an example of a display used to allow the user to specify details of how to publish a site.

Fig. 19 is a flow chart showing steps performed by the page editor software to publish a page.

25 Fig. 20 a flow chart showing steps performed by the page editor software to publish a normal page.

Fig. 21 is a flow chart showing steps performed by the page editor software to publish a stacked page.

Fig. 22 is a flow chart showing steps performed by the page editor software

5 to generate initial HTML for a page.

Fig. 23 is a flow chart showing further steps performed by the page editor software to generate an HTML table for layout elements of a page, such as a header, body, and footer.

10 Fig. 24 is a flow chart showing steps performed by the page editor software to generate an HTML table.

Fig. 25 is an example of steps performed by the page editor to generate final HTML for a page.

15 Fig. 26 is an example of first steps involved in determining an HTML size.

Fig. 27 is an example of second steps involved in determining an HTML table size.

20 Fig. 28 is an example of a matrix generated by the steps of Figs. 26 and 27.

Fig. 29 is a block diagram of how the matrix of Fig. 28 is used to generate an HTML table, which a browser uses to display a portion of a page.

25 Fig. 30 shows an example of a Style display.

Fig. 31 shows an example of an Assets' Display.

Fig. 32 shows an example of a plurality of link dialog boxes, showing a structural link, an internal link, and an external link.

25 Fig. 33 is a flow chart showing updating of structural links for a page.

Fig. 34 shows an example of a dialog box used to create a data object.

Fig. 35 shows a block diagram of an example of a stacked page and a series of data pages.

5 Fig. 36 shows an example of an icon for a stacked page.

Fig. 37 shows an example in which a user has opened the Tool window
and selected the DataList tool.

Fig. 38 shows a Properties window with a DataList tab opened for the
DataList tool and the DataList window.

10 Fig. 39 shows a further example of a Properties window with a DataList
tab.

Fig. 40 shows an example in which a user has opened the Tool window
and selected the DataField tool.

15 Fig. 41 shows a Properties window with a DataField tab opened for the
DataList tool.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference will now be made in detail to a preferred embodiment of the
invention, an example of which is illustrated in the accompanying drawings.
20 Wherever possible, the same reference numbers will be used throughout the
drawings to refer to the same or like parts.

I. System Overview

Fig. 1 is a block diagram of a computer system 100 in accordance with a
preferred embodiment of the present invention. Computer system 100 includes a
CPU 102; a memory 104; input/output lines 105; an input device 150, such as a
25 keyboard or mouse; and a display device 160, such as a display terminal.
Computer 100 also includes an input device 161, such as a floppy disk drive or CD
ROM reader, that reads computer instructions stored on computer readable
medium 162, such as a floppy disk or a CD ROM. These computer instructions are

5 the instructions of e.g., page draw editor software 120. Memory 104 includes page draw editor software 120, draw objects 130, HTML 140, and image files 140, etc., as described in further detail below.

10 A person of ordinary skill in the art will understand that memory 104 also contains additional information, such as application programs, operating systems, data, etc., which are not shown in the figure for the sake of clarity. It also will be understood that computer system 100 can also include numerous elements not shown in the Figure for the sake of clarity, such as disk drives, keyboards, display devices, network connections, additional memory, additional CPUs, LANs, internet connections, input/output lines, etc.

15 In the following discussion, it will be understood that the steps of methods and flow charts discussed preferably are performed by processor 102 executing instructions stored in memory, such as instructions of editor software 120. Editor software 120 can be initially loaded into memory from computer readable medium 162. It will also be understood that, although the following paragraphs describe an implementation of the present invention using object-oriented programming techniques, the invention is not limited to any such techniques and may be implemented using any appropriate techniques for implementing the functionality described herein. The described embodiment is written in the C++ programming language and runs under the Windows 95 operating system, but the invention is not limited to any particular programming language or operating system.
20 ("Windows 95" is a trademark of Microsoft Corporation.)
25

II. Creation and Manipulation of a Web Page Layout

Fig. 2 is a block diagram showing input and output to page draw editor

5 software 120 of Fig. 1. Page draw editor 120 includes a portion 202 that creates and manages a page layout and a portion 204 that publishes the page 140. The user uses a drag and drop interface to define the page layout. Pages can include new text and images or preexisting text and images. The user initiates publish
10 portion 204 by clicking on a "publish" button displayed by the editor 120, as described below. Publish portion 204 generates HTML for the page, as also described below. The page is translated into an HTML table that yields a WYSIWYG Web page when displayed by a browser.

A. Creating and Modifying Display Elements of a Page Layout

Fig. 3 shows an example of a page view displayed on display device 160 before the user has created any display elements on the page. The display of Fig. 15 3 is opened when the user indicates (using a pull-down menu or the like) that he wishes to create a new page. In the described embodiment, the user clicks on a "Page" button 304 in the navigator bar. The page draw editor allows the user to design a page just as it will appear when viewed with a browser. The user uses the page draw editor to add text graphics, and other display elements to the page. The user can then rearrange display elements by dragging and dropping them to a new location, placing the display elements exactly where they will eventually appear with pixel level accuracy.

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25 A title 301 of the page defaults to "Untitled" if the user has not yet named the page. Fig. 3 includes a grid of lines. These lines are shown as dotted lines, but can also be solid lines. In the described embodiment, the grid also can be turned off so that no grid is displayed. The grid preferably is not included in the generated HTML. In Fig. 3, the grid has a granularity of 24 x 24 pixels in

5 accordance with a default width as shown in a Properties window 350, as discussed below.

The display of Fig. 3 includes a plurality of buttons: a "Site" button 302, "Page" button 304, a "Style" button 306, an "Assets" button 308, and a "Publish" button 310. The display also includes a "Preview" button 312, a "New Page" button 314, a "Goto" button 316, and a "Last" button 318. Site button 302 causes execution of a "site editor". Style button 306 and Assets button 308 are discussed below. New Page button 314 causes a page such as the page of Fig. 3 to be displayed.

Goto and Last buttons 316, 318 transfer control to a most recent display or a user-selected previous display, in a manner known to persons of ordinary skill in the art. The described embodiment keeps a "history" of execution of page draw editor 120 in order to implement the Goto and Last buttons.

The display of Fig. 3 further includes a Secondary navigator bar 365, including a "Layout View" button 320 and an "HTML Source" button 322. When the user clicks on Layout View button 320, a display having a format such as that of Figs. 3-8 is displayed. When the user clicks on HTML Source button 322, a display (not shown) shows the HTML that is generated for the current page layout. Button 322 is omitted in an alternate embodiment. Other views have other buttons and toggle switches on the secondary navigator bar, as required by the particular view. Secondary navigator bar 365 contains a dotted line extending vertically downward from a currently clicked button (e.g., Page button 304) to a selected one of the buttons on secondary navigator bar 365. As the user selects different buttons on the primary and secondary navigator bars, the dotted line is redrawn to connect the

5 currently selected buttons. This feature makes it easy for a user to see which buttons are currently selected and to mentally connect the functions of the primary and secondary navigator bars.

Fig. 3 also shows "Properties" window 350 in which a "View" tab is selected. Properties window 350 includes three tabs: a "View" tab 352, a "Page" tab 354, and a "Layout" tab 356. The values shown in Properties window 350 are values for the current page. Properties window 350 currently shows view properties because View tab 352 is selected. Figs. 10(a) and 10(b) show examples of the Page and Layout tabs, respectively. A fourth tab (see, e.g., Fig. 10(c)) is a context sensitive tab and represents various properties, depending on the tool being used. Other tabs may appear in other implementations.

10 The values shown in Properties window 350 of Fig. 3 are the default values for viewing a newly created page. Properties window 350 includes a "Measurement Unit" area 360, a "Element border" flag area 362, "Grid Width" and "Grid Height" areas 364, 366, a "Show Grid" flag 365, font size areas 368, 370, a "Color" area 372, a "Horizontal Splitter" flag area 374, and a "Snap to Grid" flag area 376.

15 Thus, in the example, the grid is measured in units of pixels. Element borders are drawn around each display element on the display device. A grid of 24 x 24 pixels is displayed. The specified fonts are used. The page uses the colors described in the colors area 372. The "Snap to Grid" property is turned off. It will be understood by persons of ordinary skill in the art that page draw editor software 120 stores values corresponding to this Property window and each Property window discussed herein in memory 104. All values in Properties

5 window 350 may be changed by the user. Values in memory 104 will be changed accordingly.

The display of Fig. 3 further includes a "Tools" window 324. As shown in Fig. 9(a), Tools window 324 includes a "cursor" tool 380, a "zoom in" tool 381, and a "zoom out" tool 382. These three tools have an outward operation similar to 10 "cursor," "zoom in," and "zoom out" tools known in the art. The "cursor," "zoom in," and "zoom out" tools are collectively known as "control tools."

Tools window 324 also contains a "Text" tool 383, an "Image" tool 384, a "Draw" tool 385, a "Table" tool 386, an "Audio" tool 387, a "Video" tool 388, a "Java" tool 389, an "ActiveX" tool 390, a Shockwave tool 391, a "Form" tool 392, a "DataList" tool 393, and a "DataField" tool 394. The Text, Image, Draw, Table, 15 Audio, Video, Java, ActiveX, Shockwave, Form, dataList, and DataField tools are collectively known as "content tools." (Java is a trademark of Sun Microsystems, Inc. Shockwave is a trademark of ShockWave Corp. ActiveX is a trademark of Microsoft Corporation.) Tools window 324 also includes a plurality of buttons 395 that contain various buttons at various times, as discussed below in connection with 20 various ones of the tools.

It will be understood that the empty page of Fig. 3 can be edited in the same manner described below for an existing page.

Fig. 4 shows the display of Fig. 3, including a banner, navigator buttons, 25 and text buttons automatically created by a preferred embodiment of the present invention. The example of Fig. 4 is displayed after the user indicates that he wants to edit an existing page by preferably: 1) double clicking on an icon for the page (not shown) or 2) selecting a page icon and clicking "Page" button 304 of Fig. 3

5 (not shown). The described embodiment of the present invention automatically creates certain draw objects in memory for the page. The automatically created draw objects reflect links between pages of the site, as described below in the copending application. The user can easily create and move display elements on the page, which causes changes to corresponding draw objects in memory 104.

10 Horizontal splitters such as 380 and 382 are displayed.

The display of Fig. 4 creates a page having three parts: a header 402, a body 404, and a footer 406. The user can move the dividers 380, 382 between the header, body and footer as is known in the art. Moving the dividers adjusts the size of the header, body or footers on the finished page. The header, body and footers can also be scrolled. Page draw editor 120 allows individual scrolling in each of these parts. In the described embodiment, the page of Fig. 4 is entered from the site view, and automatically creates display elements of header 402 and footer 406 reflecting the logical connection of the current page to other pages.

20 Header 402 automatically contains a banner 410 and a plurality of navigator buttons 412. In the example, the banner contains the name of the selected page ("Products"). Navigator buttons 412 include buttons for a homepage ("Home button 4"), a "Welcome" page ("Welcome" button 416), and a "Private" page ("Private" button 418). Navigator buttons 412 preferably include an image, such as the 3D button image shown in Fig. 4. This image may be predefined or defined by the user through use of a pop-up window.

25 Thus, in Fig. 4, the navigator buttons 412 automatically include buttons corresponding to the home page and to the previous hierarchical level of the page. Alternate implementations of the present invention automatically display navigator

5 buttons for one or more of the home page, the parent page, sibling pages, and children pages. In some embodiments, the user chooses which navigator buttons are generated automatically by way of a pop-up site window. The user may add or delete additional buttons and may move buttons, as described below.

10 Footer 406 automatically contains a plurality of text buttons 428. These text buttons preferably correspond to the navigator buttons 412. Thus, text buttons 428 include buttons for the homepage ("Home text button 430), the Welcome page 452 ("Welcome" text button 432), and the "Private" page 454 ("Private" text button 434). The user may add or delete additional buttons and may move buttons, as described below. The internal memory representation of banner 410 and of buttons 412 and 430 are discussed in detail below.

15 Figs. 5-8 show an example of creation of display element in a page layout and also show an example of a modification to the page layout using a drag and drop interface in accordance with the described embodiment of the preferred invention. Fig. 5 shows the display of Fig. 4 after the user has dragged and dropped an image 502 and some text 504 into the layout. Specifically, as 20 discussed in detail below, the user creates image 502 using Image tool 382 and creates text 504 using Text tool 383. In the example, image 502 is a 324 x 216 pixel image originally stored in memory or on a storage device attached to computer system 100.

25 Fig. 6 shows a preview display of the layout of Fig. 5. Fig. 5 is displayed when the user clicks on Preview button 312 of Fig. 3 (or selects "Preview" from a pull-down menu). In order to preview a site, page draw editor 120 actually generates HTML for the current layout of the page and stores it at a predetermined

5 (or user-defined) location. The editor then invokes a browser program (such as the-
Netscape Navigator browser, version 3.x, manufactured by Netscape
Communications Corp. of Mountain View, California). The browser displays a Web
page 602 described by the generated HTML. Note that no HTML is generated for
dividers 380, 382 and that no HTML is generated for the outlines around the text
10 and image.

Fig. 7 shows the display of Fig. 5 after the user has dragged and dropped
the text to a different location on the page. Specifically, as discussed in detail
below, the user places a cursor on text 504 using input device 150 (such as a
mouse) and drags the text to a new position using input device 150. Movement of a
display element on a display device in accordance with cursor input is known in the
15 art and will not be described herein. The draw object associated with text 504 is
changed to reflect this movement as described below.

Fig. 7 also shows Properties window 350 in which "Layout" tab is selected.
The values shown in Properties window 350 are values for the current page.
Properties window 350 (with a Layout tab) includes a "Layout Name" area 702, a
20 "Width" area 704, a "Height" area 706, a "Site Style Background" 708, a "Solid
Color" area 710, a "Picture" area 712, a "Head Name" area 714, and a "Footer
Name" area 716.

Thus, in the example, Layout of Fig. 7 is currently untitled. The layout is of
25 the specified height and width. The page uses the type of background described in
areas 708-712 (i.e., a predetermined "Site style background", such as a picture of a
marbled surface) instead of a solid background or a image background provided by
the user. It will be understood by persons of ordinary skill in the art that page draw

5 editor software 120 stores values corresponding to this Property window and each
Property window discussed herein in memory 104. All values in the Properties
window 350 of Fig. 7 may be changed by the user. Values in memory 104 will be
changed accordingly.

10 Fig. 8 shows a preview display of the layout of Fig. 7. As shown in Fig. 7,
the user has dragged and dropped text 504 to a new location, thus changing the
page layout. The Preview function causes new HTML for the changed page layout
to be generated and the new HTML to be displayed by the browser in window 602.
It will be understood that, in the Preview views of both Figs. 6 and 8, the HTML
generated for the page causes a browser to display a page that is pixel-per-pixel
15 the same as the display elements on the display screen, assuming that the browser
supports Netscape version 3.X. Thus, the user can design a page layout and
expect the page to look exactly as it was designed when the page is displayed by a
browser. Tag 802 is an optional line resulting from HTML generated in the
described embodiment of the present invention.

20 **1. The Pull Down Menus**

Figs. 11(a) through 11(c) show examples of pull-down menus for the
described embodiment of draw page editor 120. Fig. 11(a) shows an Edit menu
having an Undo function, a Cut function, a Copy function, a Paste function, a Paste
Special function, a Delete Page function (A delete display element function is not
25 shown), an Options function, a Preferences section, and a Duplicate Layout
function, which duplicates a current page layout (and its associated draw object
data structures) for a new page.

Fig. 11(b) shows a View pull-down menu, which includes a Page

5 Properties function that opens, e.g., Properties window 350 with a page tab selected, and Tools Palette function that opens, e.g., Tools window 324.

10 Fig. 11(c) shows a Layout pull-down menu, which includes an Align Objects function that horizontally, vertically, or centrally aligns display elements, a Center Objects function that centers display elements, a Size Objects function that sizes display elements, an Element Script function, and a Layout script function.

5

2. The Tools Window

Figs. 9(a) through 9(d) show examples of Tool window 324 and show various icons that are displayed in area 395, depending on which tool is being used. Some of the tools of the described embodiment can be thought of as a Swiss army knife; when you select one, a secondary group of tools appears in area 395, each secondary tool performing a different function on the same kind of display element.

10

3. The Text Tool

When the user clicks on Text tool 383, page draw editor 120 allows the user to enter a text display element. The user uses the cursor to create and size a text box on the display and then types text inside it. When text is created, a Text tab shown in Fig. 10(d) is displayed in the Properties window 350. This Properties window allows the user to enter properties of the text display element. These properties include whether the text is bold, italic, or has a strike-out bar, the font, the font size, paragraph alignment, and whether to use a bullet. The properties further include whether to use a predetermined "site style" for the text (i.e., a predetermined font, color, size, etc. stored in memory 104 under a "site style name") or whether to use a user-specified text color. The user may also specify a fill color for the text box. If the user indicates that the text box is also a link, he may also fill in the name of an associated script (e.g., a CGI script). Once the link is created, the location of the link is added to a list of hotspot locations stored in memory and values are stored in the text draw object to indicate that the text contains a hot spot and its URL. Once the user has specified the text, a text draw object is added to the list of draw objects. Currently, not all browsers support

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5 custom fonts. Netscape Navigator 3.0, however, supports such custom fonts and other browsers are expected to do so in the future.

4. The Image Tool

When the user clicks on Image tool 384, page draw editor 120 allows the user to specify an image display element. Unlike the text boundary, the image boundary resizes to fit a user-specified image. Once the image has been added to the display, the user can create a link on all or part of the image or select one color in the image as transparent. The user can also change the size of the image using the cursor.

When the user clicks on Image tool 384, page draw editor 120 displays a Draw tab (not shown) in properties window 350 in addition to the tabs shown in Fig. 15 3 and alters the Tool Window 324 as shown in Fig. 9(b). This Properties window allows the user to enter a name of an existing image and various properties of the image, such as whether the image is transparent, whether a fill background should be added to the image, and whether the image contains a link (e.g., a URL). The image tool has five secondary tools, shown in Fig. 9(b). Tool 3050 allows the user to draw a boundary in which to place the image file. Tool 3052 allows the user to click on a color of the image that he wants to be transparent. When the image is displayed, pixels of that color in the image will be suppressed so that the background will show through. (This means that a new image with a transparent color must be generated when the HTML is generated). A flag in the Image draw object is set to indicate transparency.

Tools 3054-3056 allow the user to specify a "hotspot" on the image having different shapes. The user can create a rectangular, circular, or polygon hotspot.

5 The user draws and sizes the hotspot on the display using the cursor and identifies
the link/URL for the hotspot using a pop-up window (not shown). Once the hotspot
is created, it is represented in the display by slightly distorting the image in the
hotspot area. The hotspot is added to a list of hotspot locations stored in memory
and values are stored in the object to indicate that the image contains a hot spot
and its URL. Once the user has specified the image, the image is displayed (e.g.,
10 image 502 of Fig. 5) and an image draw object is added to the list of draw objects.

5. The Draw Tool

When the user clicks on Draw tool 385, page draw editor 120 allows the
user to enter a Draw display element. The Draw tool has five secondary tools 395,
15 shown in Fig. 9(d): rectangle 1950, round rectangle 1952, ellipse 1953, line 1954,
and polygon 1955. When the user clicks on Draw tool 385, the page draw editor
displays the secondary draw tools 395 of Fig. 9(d). The user can then choose a
secondary draw tool. If, for example, the user selects rectangle 1950, a rectangle
Draw tab (see Fig. 10(c)) appears in Properties window 350 in addition to the tabs
20 shown in Fig. 3. Similar tabs appear when the other secondary draw tools are
selected. The Polygon tool allows the user to draw a polygon using the cursor, as
is known.

In the example, Properties window 350 allows the user to enter properties
of the rectangle, such as the color of the rectangle, the border color and size of the
rectangle, any text inside the rectangle (and its properties), whether a fill
25 background should be added to the image, and whether the image contains a link
background should be added to the image, and whether the image contains a link
(e.g., a URL). Once the user has specified the shape, the shape is displayed on
the screen and an image draw object is added to the list of draw objects. In the

described embodiment, each type of draw element has a different type of draw object.

6. The Table Tool

When the user clicks on Table tool 386, the page editor 120 allows the user to enter a table in the display. The Table tool causes a table window to be opened (see Fig. 10(h)). When the user clicks on Table tool 386, the page draw editor displays a "table" tab in Properties window 350 of Fig. 10(h). The user can then specify the dimensions of the table. For example, the user can specify the number of columns, the number of rows, and the type of object that goes in each cell of the table. Once the user has specified the table, the table is displayed on the screen and a table draw object is added to the list of draw objects. A table layout element cause a table to be generated inside a table when HTML is generated for the page.

7. The Sound Tool

When the user clicks on Sound tool 387, page draw editor 120 allows the user to draw a boundary in which to place an icon as a visual placeholder for an audio file. The audio file is specified through a Properties tab (not shown). In the final published Web page, users can click the icon to hear the audio. Once the user has specified the audio icon and an associated sound file, the audio icon is displayed on the screen and a sound draw object is added to the list of draw objects.

8. The Video Tool

When the user clicks on Video tool 388, page draw editor 120 allows the user to draw a boundary in which to place an icon as a visual placeholder for a

5 video file. The video file is specified through a Properties tab (not shown). In the final published Web page, users can click the icon to see the video. Once the user has specified the video icon and an associated video file, the video icon is displayed on the screen and a sound draw object is added to the list of draw objects.

10 **9. The Java Tool**

When the user clicks on Java tool 389, page draw editor 120 allows the user to specify a Java applet and an address for the applet. The Java tool, the ActiveX tool, and the Shockwave tool all specify display elements that are exemplary of a type of display element called a "plug-in." Java applets are small programs that can be downloaded over the web and run on most computer platforms. The described embodiment allows the user to specify an icon for a Java applet and the location of the Java applet similarly to how the user specifies a sound or video icon and file. When page is displayed by a browser and the user clicks on the Java applet icon, the Java applet will be downloaded and executed.

20 The user specifies a Java applet and icon through use of a Java tab in Properties window 350 (see Fig. 10(f)). This Properties window allows the user to specify a class of applet, to browse through a plurality of predefined applet names, to review parameter information for the selected applet name, to specify an alternate tag for the Java icon, and to specify a script. Once the user has specified the Java icon and an associated address, the Java icon is displayed on the screen and a Java draw object is added to the list of draw objects.

25 **10. The ActiveX Tool**

When the user clicks on ActiveX tool 390, page draw editor 120 allows the

5 user to specify an ActiveX file and an address for the file. ActiveX files are small-
programs that can be downloaded over the web and run on most computer
platforms. The described embodiment allows the user to specify an icon for an
ActiveX file and the location of the ActiveX file similarly to how the user specifies a
sound or video icon and file. When page is displayed by a browser and the user
clicks on the ActiveX file icon, the ActiveX file will be downloaded and executed.
10

The user specifies an ActiveX applet. The user has specified the ActiveX
icon and an associated address, the ActiveX icon is displayed on the screen and
an ActiveX draw object is added to the list of draw objects.

11. The Shockwave Tool

15 The user specifies a Shockwave video file through use of a Shockwave tab
in Properties window 350 (see Fig. 10(g)). This Properties window allows the user
to browse a plurality of file names, to specify an alternate tag. Once the user has
specified the Shockwave file, a predetermined Shockwave icon is displayed on the
screen and a Shockwave draw object is added to the list of draw objects.

20 12. The Forms Tool

When the user clicks on Forms tool 392, page draw editor 120 allows the
user to specify elements of an HTML form. As is known, forms are an interactive
Web component. They allow a user to send data to a server, either as request for
more data or as a submission of information to the server. As is known, forms are
25 controlled by CGI scripts.

The Forms tool has six secondary tools 395, shown in Fig. 9(c): button
1950, checkbox 1952, radio button 1953, single line text 1954, multi-line text 1955,
and list box 1956 (also called a "pull-down menu"). When the user clicks on Forms

5 tool 392, the page draw editor displays the secondary draw tools 395 of Fig. 9(c). The user can then choose a secondary draw tool. If, for example, the user selects button 1950 and clicks in the display window for the page, a button display element is added to the page. In addition, a button tab (not shown) appears in Properties window 350 in addition to the tabs shown in Fig. 3. Similar tabs appear when the
10 other secondary draw tools are selected.

Using the example of a forms button, Properties window 350 allows the user to enter properties of the button, such as the color, any text inside the button (and its properties), and whether a fill background should be added to the button. In addition, the user decided whether the button is Submit button or a reset button.
15 During display, a submit button sends the contents of all the form objects to a server. A reset button allows the user to clear the form and start over.

The following paragraph describes, without limitation, other examples of the various forms elements that can be specified by the user. Each of the forms elements described below is an element of a type that is currently included in conventional hand-coded HTML forms. Other embodiments may include still other form elements not described herein. A check box is used to let users select one or more items from a group. (Editor 120 allows the user to specify what these elements are.) A radio button behaves just like a check box, except that only one radio button in a group can be checked at once. A single-line text provides an area where the user can enter a single line of text. A multi-line text provides an area where the user can enter a more than one line of text. A list box takes the form of a pop-up menu or a box with a scroll bar. Editor 120 allows the user to specify the form of a list box. Once the user has specified a form element, the video icon is
20
25

5 displayed on the screen and a form element draw object is added to the list of draw-
objects. In the described embodiment, each type of form element has a different
type of draw object. The described embodiment allows one form in the header,
one form in the body, and one form in the footer. This is because the form layout
elements do not contain an identifier as to which form they belong to. Other
10 implementations may contain such an identifier and may allow multiple forms in the
header, body, or footer.

13. Managing Assets (Files, Links, and Data Objects)

Fig. 31 shows an example of an Assets display 3100 that displays all
current files, links, and data objects for a data processing system. The display
15 3100 is generated when the user clicks on Assets button 308 of Fig. 3. (Note that a
dotted line extends from the Assets button to the Secondary navigator bar 365.)
The Assets view shows all files, hyperlinks, or data objects associated with the
current system, depending on whether the user clicks secondary button 3102,
3104, or 3106. Fig. 31 shows an example of all data objects for the page of Fig. 5.
20 It will be understood that the Assets view reflects files, links, and data objects
stored in memory 104. Newly created files, links, and data objects are stored in
memory 104 as well.

The File view shows information about all files in the site, such as: whether
the file has a type of navigation bar images, pictures, sound, video, Java applets
25 and other plug-ins. The user can change, e.g., the name and location of files and
can add and delete files through user of a dialog box (not shown).

The Links view shows information about all links in the site, such as:
whether a link is internal, external, or structural. A structural link reflects a

5 hierarchical link shown in the site view. In a preferred embodiment changing a structural link in the Assets view changes the link in the site view and between page objects in the memory. The user can change links and can add and delete links through use of a dialog box (not shown).

The Data Objects shows information about all DataObjects in the system.
10 Data objects can be internal data objects or can be ODBC (Object Data Binding Convention) objects implementing Microsoft's standard for web page/database binding. Before creating a stacked page, as discussed below, the user should first create an internal object or ODBC object for the data that is to be included in the stacked page.

15 Fig. 34 shows an example of a dialog box 3400 used to create a data object. Dialog box 3400 is displayed when the user clicks on a "new object" button (not shown) or clicks on a "new object" pull-down menu (not shown). Box 3400 includes a data object name area 3402, a data object delete button 3404, an add field button 3408, an area 3410 listing the current fields of the data object, a "get index field" button 3412, a set button 3414, and move up/down buttons 3416, 20 3418. To create a data object in memory 104, the user enters information in dialog box 3400.

14. Creation of Stacked Pages

The described embodiment allows the user to create a special type of page called a "stacked page," which is made up of "data pages." A stacked page causes the described embodiment to generate a plurality of HTML pages displaying a series of information, such as the values in a series of records from a database. Fig. 35 shows a block diagram of an example of a stacked page 3502
25

5 and a series of pages 3504 displayed when a browser views the HTML pages - created from the stacked page. To create a stacked page, the user first creates a data object, such as a data base object (as described above). The user then creates a DataList draw object and a DataField draw object for the stacked page.

10 To create a DataList draw object, the user clicks on DataList tool 393 of Fig. 3. Page draw editor 120 allows the user to specify a list of fields to be displayed on a stacked page. When the user clicks on DataField tool 394, page draw editor 120 allows the user to specify the layout of the fields in the data list. Once the user has specified a DataList and a DataField, an appropriate display element is displayed on the screen and a DataList draw object or a DataField draw object, respectively, is added to the list of draw objects for the page.

15 The following paragraphs describe an example of creation of a stacked page. Fig. 36 shows an example of an icon for a stacked page that is displayed by the site level editor described in the co-pending application of Arora et al. Once a page includes a DataList and a DataField object, it is classified as a stacked page. 20 When a page is a stacked page, it is displayed at the site level as overlapping pages icon 3602. Stacked pages are moved at the site level in substantially the same manner as normal pages. However, multiple HTML pages are generated for each stacked page.

25 Fig. 37 shows an example in which a user has opened Tool window 324 and selected DataList tool 393. The user has then specified a rectangle 3704.

Fig. 38 shows a Properties window 350 with a DataList tab 3802 opened for DataList tool 393. Fig. 38 also shows a DataList window 3802. The user specifies, in the DataList window 3803, fields of the list that can be displayed on

5 the stacked page (for example, "Headline List"). The user then clicks on the listed-
DataList fields to select which fields of the data object will be included in the
stacked page. The properties of the **DataList** are displayed in Properties window
350.

In **DataList** window 3803, the user optionally specifies a sort field 3806 in
10 the data object, and optionally sets a filter 3808 (e.g., product = "xxx," not shown).
Only values in the specified fields having the filtered value will be part of the
stacked page. The user may also specify whether any of the fields will be linked to
other pages. Fig. 40 shows "Data List Tab" in Properties window 350.

Fig. 40 shows an example in which a user has opened Tool window 324.
15 and selected **DataField** tool 394. The user has then specified a rectangle 4004.
The user names the data list ("Headline List") and defines an appearance of the
fields selected in Fig. 38. An area for each field can be sized and dragged to
define the layout of each data page in the stacked page.

Secondary navigator bar 365 includes a button bar 4006 that has four
20 buttons for managing data pages within a stacked page. These four buttons
include: a "+" button, which creates a new data page, a "-" button, which deletes
the current data page, a "back" button which displays the contents of a previous
data page, and a "forward" button, which displays the contents of a next data page.
In, for example, a data base, the user can create as many data pages as there are
25 records in the data base. Each data page will automatically contain display
elements to a first, next, and previous data page. Thus, a stacked page has a list
of draw elements. An example of such as draw element may have a structural link
to the "next" or "previous" data page. If the page is a stacked page, a flag in

5 memory is set to indicate this fact, since multiple HTML pages can be generated for a single stacked page (i.e., one HTML page for each data page).

B. Creation of Draw Objects for the Display Elements

Fig. 12 is a flow chart showing steps performed by page draw editor software 120 to edit a page layout during execution of the page draw editor. In step 1202, the page draw editor determines whether the page is a new page. If it is an existing page, in step 1204, the current page layout for the page is displayed in accordance with the already existing draw objects for the page. The page layout will include the automatically generated banner, navigator buttons, and text buttons, unless the user has previously deleted them.

15 If the page is a new page, in step 1206, the editor displays the default page layout in accordance with the draw objects for the page. The user exits the page draw editor by, e.g., clicking on Site button 302, Style button 306, Assets button 308, or Publish button 310 (or by selecting "exit" from a pull-down menu). After the user has edited a page, he can still move the page around in the site hierarchy by using the structure/site editor, as described in the co-pending application of Arora et al.

20

Fig. 13 is an example showing an internal memory representation of draw objects automatically generated by page draw editor software 120. The draw objects are generated when a page is created and are modified when the page is modified. The internal representation includes a list of draw objects, representing each display element of the page of Fig. 4. Thus, the list of draw objects includes a banner draw object 1302 (corresponding to banner 410), a navigator buttons draw object 1304 (corresponding to navigator buttons 412), and a text buttons draw

5 object 1306 (corresponding to text buttons 428). In the described embodiment, all draw objects of the header 402 are stored together and a pointer points to the beginning of this list. Similarly, all objects of the footer 406 are stored together and a pointer points to the beginning of this list. In the described embodiment, the user has not entered any elements into the body 404 and a pointer to body elements points to a null list. There are other elements in the layout elements list (such as 10 border elements) that are not shown for the sake of ease of explanation.

10 Fig. 14 is an example showing the internal representation of Fig. 13 after some display elements have been added by the user. The list now contains an image draw object for image 502 and a text draw object for text 504 (see Fig. 5). 15 Each draw object contains data specifying its location on the page as shown in Fig. 5. If the image or text is also a hotspot, information identifying the URL of the link is also contained in the object.

20 Fig. 15 is an example showing the internal representation after text display element 504 has been moved by the user. Note that the position of the text draw object does not change in the list of draw objects. However, the position data in 25 the text object does change to reflect the object's new position in the page layout. Similar changes are made to other page objects whenever the user alters the position, appearance, or function of the corresponding display element with the page editor 120.

It will be understood that all draw objects discussed in the following paragraphs include a screen position field (indicating the X and Y coordinates of the objects' current position on the screen), the height and width of each draw object on the screen, and various flags associated with display of the object. Flags

5 include whether the object has a frame drawn around it, whether the object may be resized to zero width or height, whether the object itself handles mouse commands internally, whether the object is currently selected, the color of the object, whether the object is transparent, whether the object contains text, etc. It will be understood that the specific flags stored in an object may vary from implementation to implementation. The position, height, width and flag values are not shown for the sake of clarity. It will also be understood that each type of draw object contains 10 the data required to describe the appearance and function of the corresponding display element.

15 Draw objects can be of a variety of types or classes. It will be understood that the present invention does not necessarily include any specific types of draw objects and may include more or fewer types of draw objects than are discussed herein. The draw objects in a preferred embodiment include, without limitation:

rectangle,
round rectangle,
line,
ellipse,
text,
picture/image,
polygon,
OLEobject,
JavaScript,
database list,
database field,

5 **form button,**
 form radio button,
 form checkbox,
 form edit,
 form combobox,
10 **form clear button,**
 zoomin,
 zoomout,
 grid,
 graphic,
15 **hotspot rectangle,**
 hotspot polygon,
 hotspot ellipse,
 background picker,
 Shockwave object,
20 **Sound,**
 Video,
 ActiveX,
 Form Multi edit, and
 MAX SHAPE

25 In the described embodiment, each type of draw object has associated information that, in general, allows the draw object to be displayed on display device 150 in accordance with user draw commands. This information is also used to generate HTML for the object (including links and anchors). The following

5 paragraphs describe some examples of draw objects.

Fig. 16(a) is an example of information associated with a draw object for a page banner. It includes a bitmap of the banner and the name of the page (e.g., "Products"). Fig. 16(b) is a first example of information associated with a draw object for a navigator button object. It includes a node number to which it will link when displayed by a browser, a name of the linked to page, and an image of the navigator button (e.g., an image using the GIF, JPEG, BMP, TIFF, EPS, or PCX file formats). Fig. 16(c) is a second example of information associated with a draw object for a navigator button. The link in the second example is a structural link, i.e., it represents a link according to relationships between the pages/nodes. Fig. 15 16(c) includes a smart link to another node, which is specified by relationship, and an image. The identity of the link is determined (updated) when the page is displayed, previewed, or published. Fig. 16(d) is an example of a draw object for a text object. It includes a node number to which it will link when displayed by a browser, a name of the linked to page, and a string displayed in the text button. In the described embodiment, each draw object contains its type, its X position, Y position, width, and height. An example of a draw object of text and a draw object for an image is shown elsewhere in this document. It will be understood that each type of display element in a page (e.g., text, image, button, etc.) has a corresponding type of draw object.

25 In the described embodiment, each draw object contains its type, its X position, Y position, width, and height and display flags. In general, each draw object contains information associated with its corresponding dialog box in which the user views properties of the display element on the page.

5

III. Publishing a Page

Once the user has created a layout for a Web page as described above, the user needs to be able to create HTML for the page in accordance with the draw objects of the page. Fig. 17 shows an example of a display used to allow the user to publish one or more pages. In the described embodiment, this display actually allows the user to publish all pages in a Web site.

Fig. 17 shows a screen displayed when the user clicks on "Publish" button 310 of Fig. 3. The screen includes three buttons "Settings" 1702, "Stage" 1704, and "Publish" 1706. Once the display of Fig. 17 is displayed, the user can either "stage" or "publish" his site. Generally, staging is performed first and publishing is performed once the site is debugged. Staging and publishing are substantially the same, differing in when they are performed during the site development process. The user can also set configuration parameters to control the publishing or staging process. Clicking on either "publish" button 1706 or "Stage" button 1704 causes the described embodiment to generate HTML code for each page in the site (or only for pages indicated by the publish flag or by the user). This process is described below.

Clicking on "Settings" button 1702 causes a pop-up window 1708 to be displayed. Clicking on "Stage" tab 1710 or "Publish" tab 1712 will display a window, which allows the user to specify a storage location for the staged or published site. Clicking on a "Modify" tab 1808 causes the pop-up window 1802 of Fig. 18 to be displayed. Window 1802 allows the user to indicate certain attributes of the HTML to be generated for the site (e.g., text only, black and white (grey scale), or low-res).

5 Fig. 19 is a flow chart showing steps performed by page draw editor software 120 to publish a page of a site. It will be understood that the steps of Fig. 19 are performed by processor 102 executing instructions in page draw editor software 120. In step 1904, if the stacked flag of the current page object indicates that the current page is a stacked page, then processor 102 creates HTML for a plurality of pages. If the current page is not a stacked page then, in step 1908, processor 102 builds HTML for a "normal" page. In either case, the HTML for the page is then written to a storage medium of the system.

10 It will be understood that, generally, each page object has a corresponding list of draw objects describing the elements of the page layout, and that processor 102 generates HTML in accordance with the lists of draw objects. As described above, each list of draw objects automatically includes draw objects representing automatically generated banners and links (e.g., to the home, parent, sibling, and/or children pages of that page). These automatic links may be structural links. 15 The draw objects of a page may also represent other, additional links added by the user that are not a part of the site hierarchy. Moreover, the user can use the page draw editor to remove some of the automatically generated draw objects links if he so desires. Unless the user explicitly removes them, however, these automatically generated links are present in each page layout. Thus, the generated HTML for each page will contain links to the home, parents, siblings, and/or children pages 20 for each page of the site view.

25

IV. HTML Generation for a Page

Fig. 20 is a flow chart showing steps performed by the structure editor software to publish a normal page. Fig. 21 is a flow chart showing steps performed

5 by the structure editor software to publish a stacked page. The steps of Figs. 20
and 21 are similar, except that the steps of Fig. 21 generates multiple HTML pages
for the stacked page. In Fig. 20 step 2002 creates initial HTML for the page as
shown in Fig. 22. This step creates the beginning of an HTML page. Steps 2004-
2008 create HTML tables for each of the header, body, and footer as shown in
10 Figs. 23 and 24. Step 2010 creates final HTML for the end of the page as shown
in Fig. 25. The preferred embodiment generates Netscape HTML version 3.X.

15 Fig. 21 shows the creation of a plurality of HTML pages for a stacked page.
Each HTML contains, for example, data for one record of a database associated
with the stacked page. Each of the plurality of HTML pages has a common format
including the same fields of the database and the same layout of the fields. Each
page of the plurality of pages has the same format, but different data.

20 Step 2214 of Fig. 22 shows that the HTML for a page includes a tag
specifying the colors that a browser will use to display regular, visited, and active
links. Other embodiments specify other HTML tags that specify other attributes
common to the page.

25 Fig. 23 is a flow chart showing steps to build an HTML table. In the
described embodiment, an HTML table is generated for the header, body, and
footer of each page. Steps 2302-2308 generate a matrix in memory 104 as
discussed below in connection with Figs. 26-29. Step 2312 create the HTML table
in accordance with the matrix as shown in Fig. 24.

Fig. 24 shows steps that create an HTML table. Step 2402 writes a table
tag including a border of zero width and cellpadding and cellspacing of zero. Step
2404 generates a table header including column and width definitions for the HTML

5 table. Steps 2406-2418 go through each row and column of the matrix to generate a plurality of cells in the HTML table. Some of the cells in the HTML table can be several columns wide and/or several rows high. Step 2420 generates an end of table tag.

10 Fig. 26 is an example of first steps involved in determining an HTML table size for a layout element of a header, body, or footer. In the example, the layout element has four display elements. Each display element corresponds to one draw object of the page. As discussed above, each draw object has an X position (a start row) and a length. Each draw object also has a Y position (a start column) and a height. For each object, a first column edge is the X start position and a second column edge is the X start position plus the length. In addition, for each 15 object, a first row edge is the Y start position and a second row edge is the Y start position plus the height. Processor 102 finds the row edges and columns edges for a current page, yielding data 2602 and 2604.

20 Fig. 27 is an example of second steps involved in determining an HTML table size for a layout element. Once the column and row edges of the draw objects are determined, the edges are sorted, duplicate edges are removed from the sorted list, yielding unique row edges and unique column edges (steps 2304 and 2306 of Fig. 23). The unique rows edges and column edges are then counted. 25 In the example, the objects have six column edges and seven row edges. Once the unique row edges and column edges are determined, the column widths and row heights for each column and row are determined.

Fig. 28 is an example of a matrix 2802 generated in accordance with the edges and draw objects. Matrix 2802 has a number of rows equal to the number of

5 row edges plus one. The matrix has a number of columns equal to the number of column edges plus one. Thus, in the example, the matrix has seven columns and eight rows. Each element 2804 of the matrix has a pointer field and an occupied flag. The element of row 7, column 2 of the matrix points to object number 1 and is marked as occupied. The next four elements in row 2 are also marked as occupied. The element of row 3, column 3 points to object number 2 and is marked as occupied. The element of row 2, column 5 points to object number 3 and is marked as occupied. The next four elements in column 5 are also marked as occupied. The element of row 5, column 3 points to object number 4 and is marked as occupied.

10

15 Fig. 29 is a block diagram of how the matrix 2802 is used to generate an HTML table. The HTML table is used by a browser to display a portion of a page on display device 160 (such as a header, body, or a footer. (An alternate embodiment of the present invention creates a single table for each page of the site). Each element of the matrix is used to generate a cell in an HTML table (although some cells occupy more than one row or more than one column). For example, the matrix element in row 1, column 1 causes an empty table cell to be generated. Each row in the HTML table has a height in pixels that is equal to the height for that matrix row. Each cell in the HTML table has a width that is equal to the width of the matrix for that column.

20

25 As is known to persons of ordinary skill in the art, the cells in the table can be of varying sizes (i.e., can use the HTML tags "ROWSPAN" and COLSPAN"). The matrix element in row 2, column 5 causes generates of a cell that spans four rows (ROWSPAN=4). The matrix element in row 7, column 2 causes generation of

5 a cell that spans five column (COLSPAN=5).

Fig. 30 shows an example of a Style display. The display of Fig. 30 is shown when the user selects Style button 306. The Style button display allows the user to select an overall default appearance of all pages in the site. The user can override the style for a given page by defining a different style for the page (not shown). In the described embodiment, the values shown in Fig. 30 are stored in locations of memory 104. The automatic generation of banners, navigation buttons, and text buttons is performed in accordance with user-specified style values.

10 Fig. 31 shows an example of an Assets Display. The Assets display shows the files, links, and objects in the data processing system. For example, the assets 15 shown in Fig. 31 are the draw objects for the "Products" page of Fig. 5.

Fig. 32 shows an example of a plurality of link dialog boxes, showing a structural link, an internal link, and an external link.

20 Fig. 33 is a flow chart showing identification of structural links for a page. The links preferably are identified when the page is displayed, previewed or published. Internal and external links are "absolute" links. Structural links are identified only as "next sibling link," "next child link", etc. For each link, the node-that-is-linked-to is identified (updated) by looking at the page hierarchy specified by the page layout tree. After the node is identified, the processor finds the URL, name, etc of the node and generates the display or HTML for the structural link.

25 In summary, the described embodiment of the present invention allows a user to define a layout of a Web page. A draw-based editor in accordance with the present invention automatically creates draw objects for each page that reflects the

5 user-defined layout. When the user "publishes" a page, the described embodiment generates HTML code for the page. A page can also be a "stacked page." A single stacked page causes generation of a plurality of HTML pages. The page defaults to a user-specified "style," which can be changed by the user.

10 Other embodiments will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope of the invention being indicated by the following claims and equivalents.

```

/* NetObjects

picture.h
definition of picture object

*/
#ifndef _PICTORBJ_H
#define _PICTORBJ_H

#include "drawobj.h"
#include "resource.h"
#include "DOFile.h"
#include "dlgbase.h"

class CModelessInsp;
class CHotSpot;
class CPictureGeneral;
class CDrawRect;

// flags for picture class
#define DRAW_NATURAL      1    //object not stretched
#define DRAW_STRETCHED     2    //object stretched to fit
#define DRAW_TILED          4    //objecxt tiled
#define DRAW_HOTSPOTON     16   // object has hot spots turned on
#define DRAW_H_ALIGN_LEFT  32   // alignment
#define DRAW_H_ALIGN_CENTER 64   // alignment
#define DRAW_H_ALIGN_RIGHT 128  // alignment
#define DRAW_V_ALIGN_TOP   256  // alignment
#define DRAW_V_ALIGN_CENTER 512  // alignment
#define DRAW_V_ALIGN_BOTTOM 1024 // alignment
#define DRAW_GIF_SOURCE    2048
#define DRAW_JPEG_SOURCE   4096
#define DRAW_UNKNOWN_SOURCE 8192
#define DRAW_GENERATEALWAYS 16384 // always rename and generate
this gif
#define DRAW_DATAOBJECT    32768 // this is a data object

// 'list' class for hot spots (requires afxtempl.h)
typedef CTypedPtrList<CObList, CHotSpot*> CHotSpotList;

class CDrawPicture : public CDrawRect
{
protected:
    DECLARE_SERIAL(CDrawPicture);
    BOOL LoadBitmap();
    CDrawPicture();
public:
    CDrawPicture(const CRect& position);
    ~CDrawPicture();
}

```

```

virtual void Serialize(CArchive &ar);
//virtual void Serialize(CArchive& ar);
virtual void Draw(CDC* pDC, CLayoutView* pView, BOOL
bxOrOutline = FALSE, CRect *pDrawRect = NULL);
void TileBackGround(CDC* pDC, CLayoutView* pView,
CRect *pRect);

virtual BOOL SetBitmap(const CPDString& aFileType =
cFILE_IMAGE_TYPE); //does the file dialog etc.

BOOL Changed(void);
void SetStretch(UINT);
UINT GetStretch();
virtual CRect GetImagePosition(CRect *position = NULL);

virtual CRect GetImageSize();
void SizeToImage(CLayoutView *p);
int GetImageHandle(void) {return
m_ImageHandle;};
long ConvertImage(CPDString *theFileName,
CPDString *theFilePath);

BOOL SetBitmap(const char *pStr, const CPDString&
aFileType = cFILE_IMAGE_TYPE);
virtual int GetSourceType(void);
virtual void OnOpen(CLayoutView* pView);

CHotSpotList* GetHotspots() { return &m_objects; }
virtual CDrawObj *RemoveChild(CDrawObj *obj);
virtual void AddChild(CDrawObj *obj);
CHotSpot* HotSpotAt(const CPoint& point, CLayoutView *
pView);
CHotSpot* HotSpotAt(const CRect& rect, CLayoutView *
pView);
void DeleteHotSpots(void);
void MakeChildrenFit(CRect *newPosition = NULL);
virtual void EndMove(CLayoutView* pView = NULL);
CRect *newPosition = NULL); // offsets all children difference of
last to new position
void MoveChildren(CPoint point); // offsets all
children using point coords
virtual CDrawObj* FindChild(int id);
virtual BOOL mAutoGenerated();
virtual int HitTest(CPoint point, CLayoutView* pView,
BOOL bSelected);

void SetHotSpotsOn(BOOL);
void GetHotSpotsOn(void);
void SetDataObjectOn(void) {m_PictureFlags |=
DRAW_DATAOBJECT; }

```

```
virtual CDrawObj* Intersects(const CRect& rect, CLayoutView
*pView);
virtual void AddPropPage(CObList&);
virtual void AddProperties(CMenu *pPopup);
virtual BOOL IsParent(void) {return TRUE;};
virtual CDrawObj* GetSelectedChild(void);
virtual void SetSelectedChild(CDrawObj *pObj, BOOL
set=TRUE);
virtual void SaveUndo(CArchive&
ar, PROPERTY_TYPE, CLayoutView *pView);
virtual void LoadUndo(CArchive&
ar, PROPERTY_TYPE, CLayoutView *pView);
virtual void SetAssetInfo(PROPERTY_TYPE type = DRAWOBJ);
virtual void SetObjectData(void);
virtual CDrawObj* Clone(CLayoutData *pLayoutData);
virtual void SetInitialValue(CLayoutView* );
virtual void DrawImageToMemory(CDC *);
CString m_csName;
int m_PictureFlags;
CHotSpotList m_objects;
void SetGenerateAlways(BOOL b = TRUE);
void SetVAlignFlag(int);
void SetHAlignFlag(int);
BOOL HasPicture() {return m_pDIB != NULL;};
void mGenerateHTML(CPDBuffer* theBuffer);

protected:
    int m_ImageHandle;
    char * m_pDIB;
    BITMAPINFO * m.biInfo;
    int m.biWidth;
    int m.biHeight;
    char * m.biBits;

private:
    static CPictureGeneral *m_pPictureProp;

protected:
    //{{AFX_MSG(CDrawPicture)
    //afx_msg void OnPictureProperty();
    //afx_msg void OnEditClear();
    //}}AFX_MSG
44
```

```
DECLARE_MESSAGE_MAP()
};

// PictureAlignment dialog
class PictureAlignment : public CTR2Dialog
{
// Construction
public:
    PictureAlignment(CWnd* pParent = NULL); // standard
constructor
    CWnd *parentWnd;
    BOOL m_Cancel;
    UINT v;
    UINT h;
    DrawShape user;
    void SetUser(DrawShape d) { user = d; }

// Dialog Data
//{{AFX_DATA(PictureAlignment)
enum { IDD = IDD_PICTURE_ALIGNMENT };
// NOTE: the ClassWizard will add data members here
//}}AFX_DATA

// Overrides
// ClassWizard generated virtual function overrides
//{{AFX_VIRTUAL(PictureAlignment)
protected:
    virtual void DoDataExchange(CDataExchange* pDX); // 
DDX/DDV support
//}}AFX_VIRTUAL

// Implementation
protected:
    // Generated message map functions
    //{{AFX_MSG(PictureAlignment)
    virtual void OnOK();
    //}}AFX_MSG
DECLARE_MESSAGE_MAP()
};

#endif // PICTOBJ_H
////////////////////////////////////////////////////////////////
```

```

// CDrawText - Text Object

#ifndef _CRICHTTEXT_H_
#define _CRICHTTEXT_H_ //1
#include "drawobj.h"

// General stuff
/////////// //////////////////////////////////////////////// //////////

// Tokens that we store in the token steam
// After a token there is potential more bytes and other tokens
// If this is the case then it is noted in the comments after the
token
// All token take up 1 byte, Each item noted in [] take one byte

// Note that all that contain data have a end token to enable
backwards searching
typedef enum {
    T_TEXT = 0,           // Dummy token just use to communicate
    that its a text token // Place holder to break up findtoken
    T_NULL,
    // Text formatting tokens turn on/off
    T_BOLDON,             // Bold
    T_BOLDOFF,
    T_ITALICON,            // Italics
    T_ITALICOFF,
    T_UNDERLINEON,         // underline
    T_UNDERLINEOFF,
    T_STRIKEOUTON,        // strikeout
    T_STRIKEOUTOFF,
    T_BLINKON,             // Blinking
    T_BLINKOFF,
    T_FIXEDON,              // Fixed pitch font
    T_FIXEDOFF,
    T_DUMMY1,               // Raw html code. Used to insert HTML code
directly into the token stream
    // Text formatting with extra data
    T_FACE,                // Font face stored as T_FACE <name>
    T_FACE,
    T_SIZE,                 // Size of font; stored as T_SIZE [size]
    T_SIZE
    T_COLOR,                // Change to COLORREF color; stored as
    T_COLOR <COLORREF> T_COLOR
    T_HEADING,               // Heading marker; stored as T_HEADING
    [heading id] T_HEADING - should follow <P>
    T_PARAFMT,                // Formatting belonging to T_PARAGRAPH -
    stored as T_PARAFMT <ParaFormat> T_PARAFMT
    T_SYMBOL,                  // Stores a symbol <T_SYMBOL> symbol value
    (int) <T_SYMBOL>
}

```

```

    T_HMTLTAG,           // A HTML tag stored

    // String flow control
    T_END,               // End of text object
    T_NEWLINE,            // New line - still inside the paragraph
    T_PARAGRAPH,          // New paragraph
    T_SOFTNEWLINE,         // Soft end of line - autowrap symbol

    // Support for html links
    T_LINKNAME,           // Link name stored as T_LINKNAME <display>
    T_LINKNAME2,
    T_LINKNAME2,
    T_LINKURL,             // Link URL stored as T_LINKURL <url>
    T_LINKURL2,
    T_LINKURL2
} TokenTypes;

// Notes:
// T_COLOR:
//   The COLORREF is stored as 4 bytes. The maximum byte
//   that is normally 0x00 will be
//   0x00 when the color is reset back to the default color
//   defined for the view. In this case
//   the rest of the color is unused. When a color ride is
//   in effect the byte is 0x00.
// T_PARAGRAPH: The line number is stored in the paragraph as
// <P><#><P>
// T_SOFTNEWLINE: Only used for return in FindToken

// Link should be stored as
// <T_LINK1> tokens <T_LINK2> URLStruct <T_LINK3>
#define OVERRIDE_OF( CR ) *( ( (char*) &(CR) )+3 )

#define MAX_INDENT 31

// Alignment settings as they apply to one paragraph
typedef enum {
    AlignLeft = 0,
    AlignCenter,
    AlignRight
};

// Bullet types
typedef enum {
    Bull_None = 0,
    Bull_Bullet,
    Bull_Square,
    Bull_Disc,
    Bull_ABC,
    Bull_abc,
    Bull_III,
    Bull_iii,
    Bull_123,
}

```

```

    Bull_UnUsed, // Used when promoting and demoting
paragraphs
};

// Pitchtype, used to select between the proportional and fixed
type font
typedef enum {
    Proportional,
    Fixed,
} PITCHTYPE;

// T_PARAFMT <ParagraphFormat> T_PARAFMT, size = 4 bytes
struct ParaFormat {
    unsigned short aAlign : 2;
    unsigned short iIndent : 5; // [ 0 .. 31 ] levels
    unsigned short iBullet : 4;
    unsigned short iOrder : 10; // Order item number
[0..1024[
    unsigned short bStart : 1; // Special start value
for ordered lists
};

// Usage of the Font list
#define FONTINDEX_AUTOMATIC 0 // position of
the Automatic font
#define FONTINDEX_MAX 127

// The complete set of font settings as will be treated for text
object.
// These settings are at any given location applied to the
current setting
// in the global font setting.
struct FontAttrib {
    BYTE      rgbRed;           // 1 b
    BYTE      rgbGreen;         // 2 b
    BYTE      rgbBlue;          // 3b
    BOOL     bColorOverride : 1; // Is the color currently
overridden
    short    iSize : 7;          // 4 b
    BOOL     bBold : 1;
    PITCHTYPE ptPitch : 3;
    BOOL     bItalic : 1;
    BOOL     bUnderline : 1;
    BOOL     bStrikeout : 1;
    BOOL     bBlink : 1;         // 5 b
    BOOL     bURL : 1;           // Are we inside an URL
display string
    unsigned short iFontIndex : 7; // 6 b
    ParaFormat pf;              // 10 b
};

// URL control structure
/////////////////////////////// The URLStruct is stored between the LINK and URL
// The URLStruct is stored between the LINK and URL

```

```
struct URLStruct
{
    int iJavaEventId;
};

class ExtFontAttrib{
    // Current attribute;
public:
    // Utility information
    CString sHeading;
    int      istyleIdx;
    URLStruct urlInfo;

    FontAttrib fAttrib;

    // Functions
    int operator== (ExtFontAttrib &fs);
    ExtFontAttrib &operator= (ExtFontAttrib &fs);
};

// Search commands to the FindText function
#define FIND_HOME          1
#define FIND_END            2
#define FIND_PREVCHAR       3
#define FIND_NEXTCHAR       4
#define FIND_PREVWORD       5
#define FIND_NEXTWORD       6
#define FIND_PREV PARA     7
#define FIND_NEXT PARA     8
#define FIND_PREV LINE     9
#define FIND_NEXT LINE    10

class CLayoutView;

#define TALIGN_LEFT         0x01
#define TALIGN_CENTER        0x02
#define TALIGN_RIGHT         0x04

struct FindReplaceData {
    int iIndex;
    CFindReplaceDialog *pFRDlg;
    int iFound1;
    int iFound2;
    int caret0, caret1;
    BOOL bRewrapped;
};

// CDrawText
/////////////////
///////////////
struct CaretStruct
{
    BOOL      getIndex; // is index valid, if not then pos is
    valid - calc index in UpdateCaret
};
```

```

int index;           // index into m_text;
BOOL valid;          // if index set - status if its OK
CPoint pos;           // mouse pos, not maintained if
valid is TRUE
int height;          // height of character at
caret position - if
CPoint mousePos;
BOOL xset;
};

struct LineInfoStruct
{
public:
    int width;           // width of text excl. the
space needed for indent or bullet
    int height;
    int base;
    CPoint ul;           // Top left corner of the text
box, if bullet then its before the text box
    int idxLine;          // Index into the text stream of
line. either point to <P> <BR> or to char that is first on
softbreak line
    FontAttrib fa;         // FontAttrib for the start of the
line after all heading and aling have been applied
    int iStyleIdx;        // Index of the style used
    int fFlags;            // Flags for the line
};

// Line flags
#define LINE_PARAGRAPH 0x0001 // Line is start of new
paragraph
// Different hardcoded sizes that HTML assumes
#define INDENT_SIZE 40 //700 // Total indent size
#define BULLET_SIZE 30 //300 // Space for bullet
#define BULLET_SPACE 6 //50 // Space after bullet and
before text
// Minimum Wrap width accepted
#define MIN_WIDTH 10
// Edit mode flags
#define EDIT_READONLY 0x00000001 // Field is
read-only - user may not change ny content - inspector is
disabled
#define EDIT_ASCIIFIELD 0x00000002 // Field may only
contain ascii string
#define EDIT_SINGLELINE 0x00000004 // User must not be
able to insert line break or paragraph
// Undo information

```

```

enum UndoOp {
    OpInsert,           // Insert bytes into buffer
    OpDelete,           // Delete bytes from buffer
    OpCaret,            // Position caret
    OpAssign,            // assign single byte in buffer
    OpSetT_NULL,        // assign range to T_NULL
    OpMoveBytes,         // move range inside buffer
    OpAssignBytes,       // assign range of bytes in buffer
    OpRewrapAll,         // whole object should be rewapped
};

struct UndoRecord {
    char nOpType;
    union {
        // Used when inserting (OpInsert) or deleting
        // (OpDelete) bytes in the stream
        // and when setting bytes to T_NULL (OpSetT_NULL)
        // and when assigning a range of bytes (OpAssignBytes).
        // and used for OpMoveBytes
        // when OpDelete it is followed by bytes deleted
        struct {
            unsigned short iNoBytes;
            unsigned short iIndex;
        } insdel;
        // Used when position the caret
        struct {
            unsigned short index0;
            unsigned short index1;
        } caret;
        // Used when []= assigning a single byte
        struct {
            unsigned short iIndex;
            char coldByte;
        } assign;
    } data;
};

#define UNDOBUFFER_INCREMENT      256          // increase buffer
#define increment                 UNDOBUFFER_INCREMENT
#define UNDOBUFFER_MINSIZE        256          // Max
#define MAX_FONT_LENGTH           8
#define size for a font face name
#define PRIVATE_KEYSTATE          (65536 * 4)
#define MAX_TEXT                  (MAX_TEXT - 1000)
#define MAX_TEXT_EDIT

```

```

#define WRAP_FIRSTLINE          0
#define WRAP_LASTLINE           MAX_TEXT
#define WRAP_UNDEFINED          -1

extern BOOL IsChar( char c);
extern BOOL IsToken( char c);
extern BOOL WordDelimiter( char c);
extern BOOL HardLineDelimiter( char c);
extern BOOL LineDelimiter( char c);
extern BOOL ParaDelimiter( char c);
extern BOOL ParaFormatting( char c);
extern BOOL IsFormatToken( char c);
extern BOOL IsNonNormalizeToken( char c);
extern BOOL IsOrdered( int iType);
extern BOOL IsUnordered( int iType);
extern int TokenSize( int token, BOOL bForward);
extern int iT2clipbordFormat;
extern int iRTFclipboardFormat;

extern int m[];
extern int d[];

class CTextStyle;

// Class CDrawText
/////////////////////////////// CDrawText //////////////////////////////

//class CTextHTMLGenerator;

class CDrawText : public CDrawRect
{
    friend class CTextHTMLGenerator;

public:
    char          *m_text;
    int           m_nText;
    BOOL          bSelectAnchor;           // Are we currently
    selecting using anchor point
    static   CStringArray *m_FontFaceArray; // Font face
    list

private:
    int           m_needsWrap;
    CPoint        m_LeftMargin;
    CPoint        m_RightMargin;
    int           m_clickCount;           //dont start edit mode
    until second click

    CFont         *m_oldCFont;
    CFont         m_CFont;                //Active font, setup
    during calls to gettextsegment
    int           m_iWrapIdx1;
    int           m_iWrapIdx2;

```

```

int m_maxText;                                //maximum allocated text
int m_insertIndex;
int m_haveCaretAndHeight;
int m_iCaretWidth;
CRgn *m_pRgnCaret;      //marked block
BOOL m_setMouseXPos;

// For mouse selection
static CaretStruct *m_pDblClick_Carets;        // contains dbl
marked selection while mouse is still down
static CaretStruct *m_pTriclick_Carets;         // contains tri
marked selection while mouse is still down
static CaretStruct *m_pClick_Carets;             // contains mouse marked
selection while mouse is still down
static BOOL m_bMDragOverride;                  // override that we must
NOT do word extension in single click draw select

LineInfoStruct * m_lineInfo; // display lines
int m_nLines;           // used lines in above
int m_maxLines;          // max no lines

int m_hMarg;
int m_vMarg;

static CT TextStyle     *m_pTextProp;           //property
sheet belonging to object
static BOOL bReturnFirstPara;                 //return a <P>
at start of data

FindReplaceData
*m_FindReplace;

BOOL m_Transparent;              // Is the control
transparent
BOOL m_LockedSize;              // Is the text size
locked
CSIZE m_sizeLockSize;           // The locked size
UINT m_EditMode;                // Edit mode flags

COLORREF m_BackGroundColor;    // Background color when not
transparent

char *m_pUndo;                  // Undo record buffer
int m_nUndoLen;                // length of under buffer
                                // Next location in undo
int m_iUndo;
buffer
BOOL bRecordUndo;               // wheater to record or not in
::Insert and ::Delete

```

```
CaretStruct    m_caret[2];           //cursor/block location,
if positions are the same, no marking

ExtFontAttrib   m_FontSet;          // Settings set
while gettextsegment traverses text
    ExtFontAttrib   m_OldFontSet;     // Compare copy for

SelectFont

    int  m_TrueHeight;             //true height of text,
different than size when m_Locked is TRUE

private:
    static COLORREF      m_TextColor;
    static COLORREF      m_TextLinkColor;

protected:
    DECLARE_SERIAL(CDrawText);
    CDrawText();

public:
    CDrawText(const CRect& position);
    ~CDrawText();
    virtual void Serialize(CArchive &ar);
    virtual void AddProperties(CMenu *pPopup);
    virtual void Draw(CDC *pDC, CLayoutView* pView, BOOL
bxorOutline = FALSE, CRect *pDrawRect = NULL);
    virtual void MoveTo(const CRect& position, CLayoutView* pView
= NULL, BOOL fAutoSize = TRUE, BOOL fOutline = TRUE);
    //property sheet support
    virtual void AddPropPage(CObList&);

    virtual void Select(CPoint p1, CPoint p2);
    virtual void KeyDown(UINT nChar, UINT nRepCnt, UINT nFlags);
    virtual void CharDown(UINT nChar, UINT nRepCnt, UINT
nFlags);
    virtual void SysKeyUp(UINT nChar, UINT nRepCnt, UINT
nFlags);
    virtual void StartMove( void );
    virtual void EndMove( CLayoutView *pView );
    virtual void OnLButtonDown(CLayoutView* pView, UINT nFlags,
const CPoint& point);
    virtual void OnLButtonUp(CLayoutView* pView, UINT nFlags,
const CPoint& point);
    virtual void OnMouseMove(CLayoutView* pView, UINT nFlags,
const CPoint& point);
    virtual void OnLButtonDblClk(CLayoutView* pView, UINT
nFlags, const CPoint& point);
```

```
    virtual void SaveUndo(CArchive& ar, PROPERTY_TYPE, CLayoutView
*pView);
    virtual void LoadUndo(CArchive& ar, PROPERTY_TYPE, CLayoutView
*pView);
    virtual void mSynchronizeAssetNumbers();
    BOOL virtual FindReplace( fOperations frOp, void *pData);
void Activate( TrackerState tsNewState = tsNormal);
void Deactivate( TrackerState tsNewState = tsNormal);

    virtual void SetFocus( void);
    virtual void KillFocus( void);
void GetText(char ** data, int * nData);
void SetText(char * data, int nData);
void SetAsciiText(char *pString, BOOL bKeepFormat);
char *GetAsciiText( void);
void mGenerateHTML(CPDBuffer* theBuffer);
void GetFont(ExtFontAttrib &fs, int iCaretIdx = -2);
void SetFont(TokenTypes t_type);
void SetFontAlignment( int iAlign);
void SetFontBullit( int iBullit);
void SetFontSize( int iSize);
void SetFontColor( COLORREF *pColor);
void SetFontFace( char *pFontFace);
void ChangeIndent( int iChange);
void SetSizeList( CComboBox *pComboBox, ExtFontAttrib& fs);
void SetBulletList( CComboBox *pComboBox, ExtFontAttrib&
fs);
int FindFontIndex( char *pFontFace);
static void InitFontFaceArray( void);
static void SetFontFaceList( CComboBox *pComboBox);

    void SetStyle( CString *psStyle);
    void ApplyURL(CString& sDisp, CString& sURL, char lToken,
char rToken,int iJavaEventId = 0);
    void SetURL( CString& sDisp, CString& sURL, BOOL bAddSpaces
= FALSE, int iJavaEventId = 0);
    BOOL GetURL( CString& sDisp, CString& sURL, int& link1, int&
link2, int& url1, int& url2, int iJava);
    void UpdateURL( CString& sURL, int i1, int i2);
    void Unlink( int i1, int i2, int l1, int l2);
    BOOL GetSelectedText( CString& sText, int& i1, int& i2);

// Java event access functions
int GetJavaEvent( void);
BOOL SetJavaEvent( int iJavaEventId);
```

```

// External access methods
COLORREF GetBackColor( void);
void SetBackColor( COLORREF c);
BOOL GetTransparent( void);
void SetTransparent( BOOL t);
BOOL GetLockedSize( void);
void SetLockedSize( BOOL ls);
BOOL IsStyleUsed( CString *psStyleName);
void ResizeToOneLine( CLayoutView *pView, int iIndex = 0);
void ResizeObject( CLayoutView *pView, int ix, int iy);
void GetWordCounts( int *pLine, int *pPara, int *pWord, int
*pChars);
UINT GetEditMode( void) {return m_EditMode;};
void SetEditMode( UINT fFlags) {m_EditMode = fFlags;};

static void GetMinRect(CRect&);

private:
    void CalcFontSizes( PITCHTYPE pt, int *pFontSizes);
    virtual BOOL HasFont() {return TRUE;};
    BOOL CreateFont( CFont &font, ExtFontAttrib &fs);
    void InitSelectFont( CDC *pDC);
    BOOL SelectFont(ExtFontAttrib & fs, CDC *pDC);
    void AsciiSelectAll( void);
    void MouseSelectWord(CLayoutView* pView, UINT nFlags, const
CPoint& point);
    void MouseSelectParagraph(CLayoutView* pView, UINT nFlags,
const CPoint& point);
    void UpdateCaret( CLayoutView *pView);
    BOOL IsEmpty();

    char NextChar(int& iStart);
    char PrevChar(int& iStart);
    BOOL FindStream( int& index, int where);
    void GetFontAtIndex(ExtFontAttrib &fs, int index);
    int GetParaFormat( int iLine);
    int FindFirstLineAtLevel( int iLine, int iLevel);
    void RewrapLevelAtLine( int iLine, int iLevel);
    void ApplyBulletToParagraphLevel( int iLine, int
iBulletType);
    void ApplyParaFormat( int iKind, int iValue);
    void ApplyIndentToParagraph( int iLine, int iChange);
    int ApplyStyleToPara( CString *psStyle, int iPara, BOOL
bRemoveFormatting);
    void ApplyStyle( CString *psStyle, BOOL bRemoveFormatting);

    void SetSimpleType( char *token1, char *token2, int
iTokenSize1, int iTokenSize2, BOOL bSymmetric = TRUE);
    void LineInfoUpdate( int iLocation, int nData);
    void Insert(int iIndex, const char * data, int nData);
    void Insert(int iIndex, char token);
    void Delete(int nData);

```

```
void DelText(int index1, int index2, BOOL bPreserveTokens =  
TRUE);  
void EnsureURLforDelete( int& idx1, int& idx2);  
BOOL DeleteSelection( void);  
int ExtractAsciiToBuffer( char *pText, int iIndex1, int  
iIndex2, int iLen);  
public:  
    void Delete( int index, int count);  
private:  
    BOOL SkipJunk( int& index, BOOL bForward);  
    void UpdateCaret(char token, int iC, int nL, int iStart, int  
nChars, CPoint gpos, CDC *pDC);  
    void UpdateSelectRegion( CLayoutView* pView);  
    void RemoveSelectRegion( CLayoutView* pView);  
    void FreeSelectRegion( void);  
    void InvertSelectRegion( CDC *pDC);  
    CRgn *GetSelectRegion( void);  
    void ScrollCaretIntoView( CLayoutView* pView, int iCaret);  
    void UpdateWndCaret( CLayoutView* pView);  
    void FreeWndCaret( CLayoutView* pView);  
    void UpdateMarking( CLayoutview *pView);  
    void UpdateTextObject( CLayoutView *pView = NULL);  
    int FindMatchToken( char token, int& isize, int iStart, int  
iEnd);  
    int CompressTokens( int idx1, int idx2);  
    int NormalizeStream( int idx1, int idx2, int *piNewEnd);  
    void Normalize( int idx1, int idx2);  
    void Normalize( void);  
    void InitFontSet( ExtFontAttrib& fs);  
    void InitFontSettings( void);  
    void InitFindToken( BOOL bReturnFirstParagraph = FALSE);  
    int FindToken( int& iStart, int *iText = NULL, int *iTextLen  
= NULL, int iLineBreak = 0);  
    BOOL FindText(int where);  
    void Realloc(int reqSize);  
  
    // Wrap functions  
    void AllWrapped( void);  
    void RewrapParagraph( int iParaIdx);  
    void Rewrap( int idx1, int idx2);  
    void RewrapLines( int iLine1, int iLine2);  
    void RewrapAll( void);  
    void Wrap( CLayoutView *pview, CDC *pDCin = NULL);  
    void SkipLineDelimiter( int& idx);  
  
    void SkipRTF();  
    void SelectText( CPoint p1, CPoint p2 );  
    void PositionIndex( int& index);
```

```
void PositionCaret( int idx);
void PositionCarets( void);

int DocToClientToDoc( CDC *pDC, int iY);
void DisplayBackground(CLayoutView* pView, CDC *pDC, CRect
*pDrawRect);
void Display(CLayoutView* pView, CDC *pDC, CRect
*pDrawRect);
void DisplayText(CDC *pDC, BOOL extentOnly, BOOL drawItAll);

void CommonInitialization();
int EnsureCorrectForCopy( int& idx1, int& idx2);
void EnsureCorrectStartMarking( int& si, int& ei);
int GetSelection( int& si, int& ei);
int InsertColorSize( FontAttrib& fa);
int InsertSettings( FontAttrib& fa);
char *MakeOnSettings( FontAttrib &fa, int *pLen, BOOL
bOnlyColorSize = FALSE);
int CompressTNULLs( char *pTokens, int len, int idx1, int
idx2, BOOL bUpdateCaret);
void CompressTNULLs( void);
void ClearRegion( int& idx1, int& idx2);
void EnsureURLforCopy( int& idx1, int& idx2);
void RemoveURLs( char *pToken, int len);
void InvalidateLines( int iFirstLine, int iLastLine);
void InvalidateLine( int iLine);
int GetLineFromIndex( int index);
void InvalidateRange( int idx1, int idx2);
void InvalidateSelection( void);
void InvalObjAndParent( CLayoutView *pView, BOOL bErase =
TRUE);

// Undo buffer functions
void InitUndo( void);
void AllocUndo( int iNeeded);
void RecordUndo( UndoOp opCode, int iInt1, int iInt2, void
*pBytes = NULL);
void FreeUndo( void);
void EmptyUndo( void);
void MarkUndo( void);
void Undo( void);
void RecordCarets( void);
void RecordRewrapAll( void);
void AssignTokenUndoable( int iIndex, char cNewValue);
void AssignTokensUndoable( int iIndex, int iNoBytes, char
*pData);
void SetT_NULLundoable( int iIndex, int iNoBytes);
void MoveTokensUndoable( int iDest, int isrc, int iSize);
void OnPreUndo(void *pObj);

private:
void MoveDelete( int iKind);
```

```
    BOOL FindMatch( BOOL bCaseSensitive, int iStart, int iLen,
LPCSTR pTarget, int &iNext);
    BOOL Find( void );
    BOOL Replace( void );
    BOOL nextFindReplace(CLayoutView *pView, frOperations frOp,
int& iReplace);

protected:
//{{AFX_MSG(CDrawText)
afx_msg void OnTextProperty();
afx_msg void OnEditCut();
afx_msg void OnEditCopy();
afx_msg void OnEditPaste();
afx_msg void OnEditSelectAll();
afx_msg void OnEditClear();
afx_msg void OnToolsPromote();
afx_msg void OnToolsDemote();
afx_msg void OnToolsWordCount();
afx_msg void OnToolsInsertSymbol();
afx_msg void OnToolsListStart();
afx_msg void OnUpdateToolsListStart(CCmdUI* pCmdUI);
afx_msg void OnUpdateEditCut(CCmdUI* pCmdUI);
afx_msg void OnUpdateEditCopy(CCmdUI* pCmdUI);
afx_msg void OnUpdateEditPaste(CCmdUI* pCmdUI);
afx_msg void OnUpdateEditSelectAll(CCmdUI* pCmdUI);
afx_msg void OnUpdateEditClear(CCmdUI* pCmdUI);
afx_msg void OnStyleChanged(void *pObj);
afx_msg void OnRecalc(void *pObj);
afx_msg void OnInitialUpdate(void *pObj);
//}}AFX_MSG
DECLARE_MESSAGE_MAP()
};

//#define COLOR_LINK      RGB(0,0,255)
//#define COLOR_RAWHTML   RGB(255,0,0)
#endif
```

5 WHAT IS CLAIMED IS:

1. A method of allowing a user to define a World Wide Web page comprising the steps, performed by a data processing system, of:

displaying a plurality of page display elements on a display device, the display elements forming a page layout on the display device;

10 receiving an indication that the user wants to add a new display element to the page at a first position on the page;

15 adding a new draw data structure in a memory of the data processing system for the new display element to a plurality of other draw data structures, the draw data structures corresponding to the plurality of page display elements, where the new draw data structure includes data representing the first position; and

generating HTML that substantially reflects the displayed page layout on a pixel by pixel basis in accordance with the draw data structures.

—2. A method of allowing a user to define a World Wide Web page comprising the steps, performed by a data processing system, of:

displaying a plurality of page display elements on a display device, the display elements forming a page layout on the display device;

receiving an indication that the user wants to add a new display element to the page at a first position on the page;

25 adding a new draw data structure in a memory of the data processing system for the new display element to a plurality of other draw data structures, the draw data structures corresponding to the plurality of page display elements, where the new draw data structure includes data representing the first

5 position; and

generating an HTML table that substantially reflects the displayed page layout on a pixel by pixel basis in accordance with the draw data structures.

10 3. The method of claim 1, where the page display elements displayed on the display device are created via a tools menu displayed on the display screen.

15 4. The method of claim 1, where the page display elements displayed on the display device include at least one of the group drawn images, audio, and video display elements.

15 5. The method of claim 1, where the page display elements displayed on the display device represents a plug-in.

20 6. The method of claim 1, where the page display elements displayed on the display device include at least one of the group: form, datalist, and datafield display elements.

25 7. The method of claim 1, further comprising the step of creating a page layout on the display device and a corresponding plurality of draw objects in the memory, where the page layout includes a header, a body, and a footer.

8. The method of claim 7, where the header includes a banner and a plurality of navigator buttons.

5

9. The method of claim 7, where the footer includes a plurality of text buttons.

10. The method of claim 1, wherein the HTML generating step is performed in response to the user activating a PREVIEW button on the display.

11. The method of claim 1, wherein the generating step is performed in response to the user activating a PUBLISH button on the display.

15 12. The method of claim 1, further comprising the step of creating a page layout on the display device and a corresponding plurality of draw objects in the memory, where the page layout includes at least one of a header and a footer, the size of which can be adjusted by the user.

20 13. The method of claim 1, wherein the step of receiving an indication that the user wants to add a new display element to the page at a first position on the page includes a step of:

receiving an indication that the user has indicated a drawing tool on a tools menu on the display device.

25 14. The method of claim 1, wherein the step of generating HTML includes the steps of:

creating HTML for the page header;

creating HTML for the page body; and
creating HTML for the page footer.

10

15. The method of claim 14, further comprising the step of:
creating initial HTML for the page.

15

17. The method of claim 1, wherein the generating step includes the step of generating HTML for a normal page.

20

19. The method of claim 1, wherein the generating step includes the step of generating an HTML table, which includes the substeps of:

 - finding row edges of display elements on the page;
 - finding column edges of display elements on the page;
 - creating a matrix in a memory of the data processing system, where the matrix cells point to the draw data structures;
 - finding the height and width of each column in the matrix; and
 - generating the HTML table in accordance with the height and width of each column in the matrix and the draw data structures.

5

20. The method of claim 1, wherein the generating step includes the steps of:

generating a matrix representing the size and layout of the display elements; and

10 generating an HTML table in accordance with the matrix.

21. The method of claim 1, further including the steps of:

viewing the HTML via a web browser, where the page displayed by the browser corresponds to the displayed page layout on a pixel by pixel basis.

15

22. The method of claim 1, further including the steps of:

receiving input by the user indicating a page style definition; and wherein the generating step includes the step of generating HTML

20 in accordance with the page style input by the user.

21. The method of claim 1, further including the steps of:

allowing the user to specify a hotspot on the display layout; and allowing the user to specify an address associated with the hotspot, wherein the generating step includes the step of generating an

25 HTML link in accordance with a location of the hotspot on the display layout and the address.

24. The method of claim 1, further including the steps of:

30 allowing the user to specify a link location on the display layout; and allowing the user to specify another page associated with the link;

5 wherein the generating step includes the step of generating an
HTML in accordance with a location of the link on the lease layout and with the
page specified by the user.

10 25. The method of claim 1, further comprising the steps of:

allowing the user to specify a link type that is one of a structural link,
an internal link, or an external link; and
allowing the user to specify a link location,
wherein the generating step includes the step of generating an
HTML link in accordance with the link type, and location.

15 26. An apparatus allowing a user to define a World Wide Web page,
comprising:

a memory;
a portion configured to display a plurality of page display elements
on a display device, the display elements forming a page layout on the display
device;
a portion configured to receive an indication that the user wants to
add a new display element to the page at a first position on the page;
a portion configured to add a new draw data structure in the memory
for the new display element to a plurality of other draw data structures, the draw
data structures corresponding to the plurality of page display elements, where the
new draw data structure includes data representing the first position; and
a portion configured to generate HTML that substantially reflects the
displayed page layout on a pixel by pixel basis in accordance with the draw data
structures.

5

27. A computer program product, comprising:
a computer usable medium having computer readable code embodied
therein for allowing a user to define a World Wide Web page, the computer
program product comprising:

10

computer readable program code devices configured to cause a
computer to effect displaying a plurality of page display elements on a display
device, the display elements forming a page layout on the display device;

computer readable program code devices configured to cause a
computer to effect receiving an indication that the user wants to add a new display
element to the page at a first position on the page;

15

computer readable program code devices configured to cause a
computer to effect adding a new draw data structure in the memory for the new
display element to a plurality of other draw data structures, the draw data
structures corresponding to the plurality of page display elements, where the new
draw data structure includes data representing the first position; and

20

computer readable program code devices configured to cause a
computer to effect generating HTML that substantially reflects the displayed page
layout on a pixel by pixel basis in accordance with the draw data structures.—

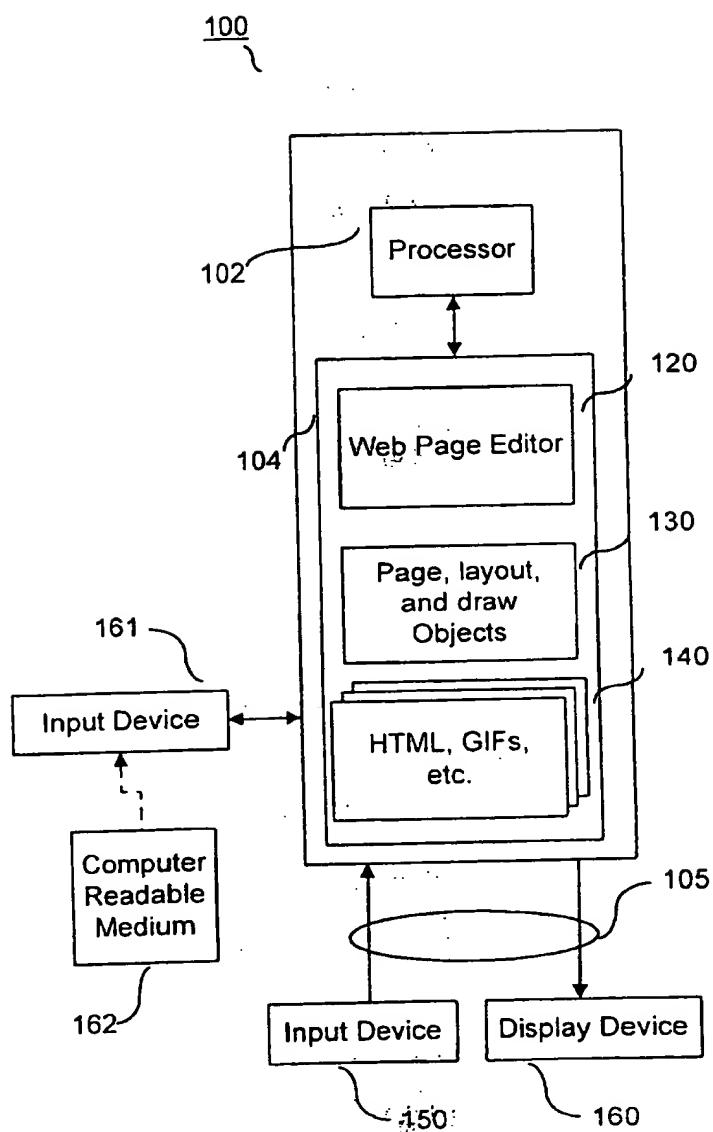


Fig. 1

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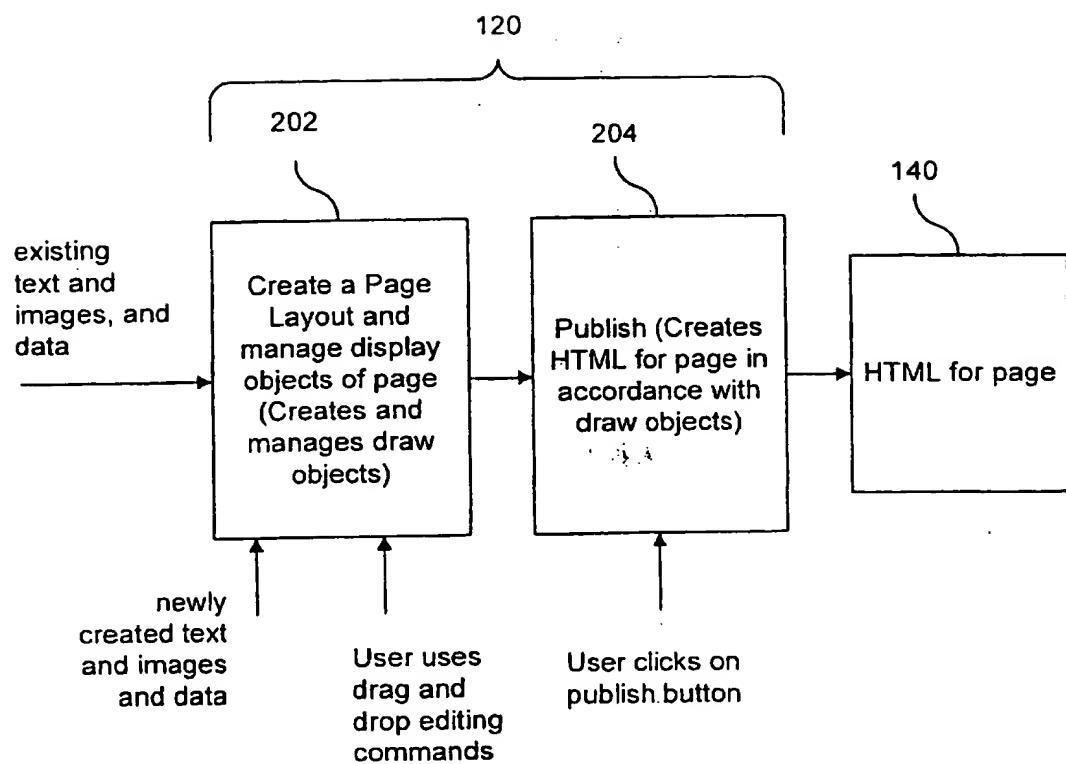


FIG. 2

SUBSTITUTE SHEET (RULE 26)

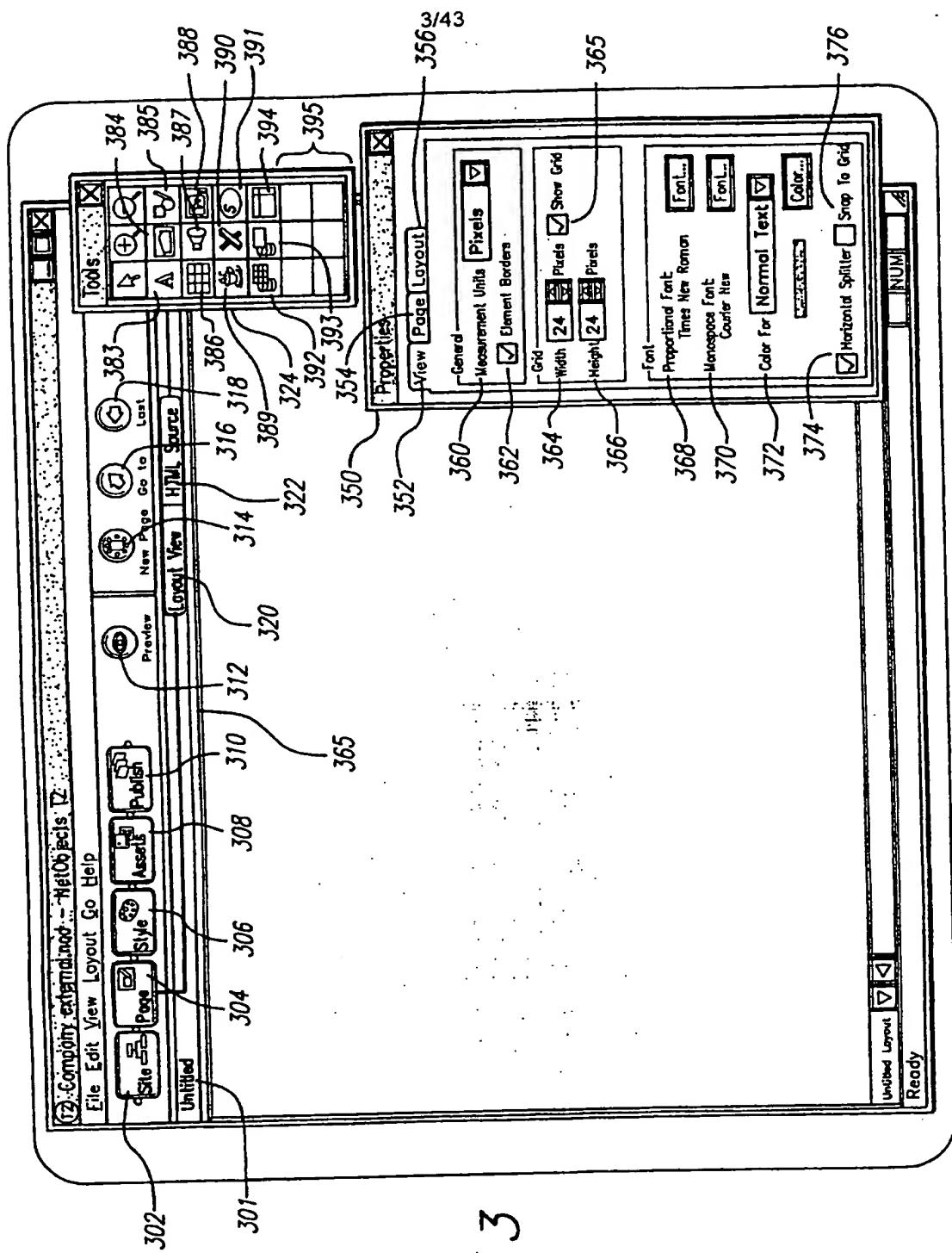


FIG. 3

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4/43

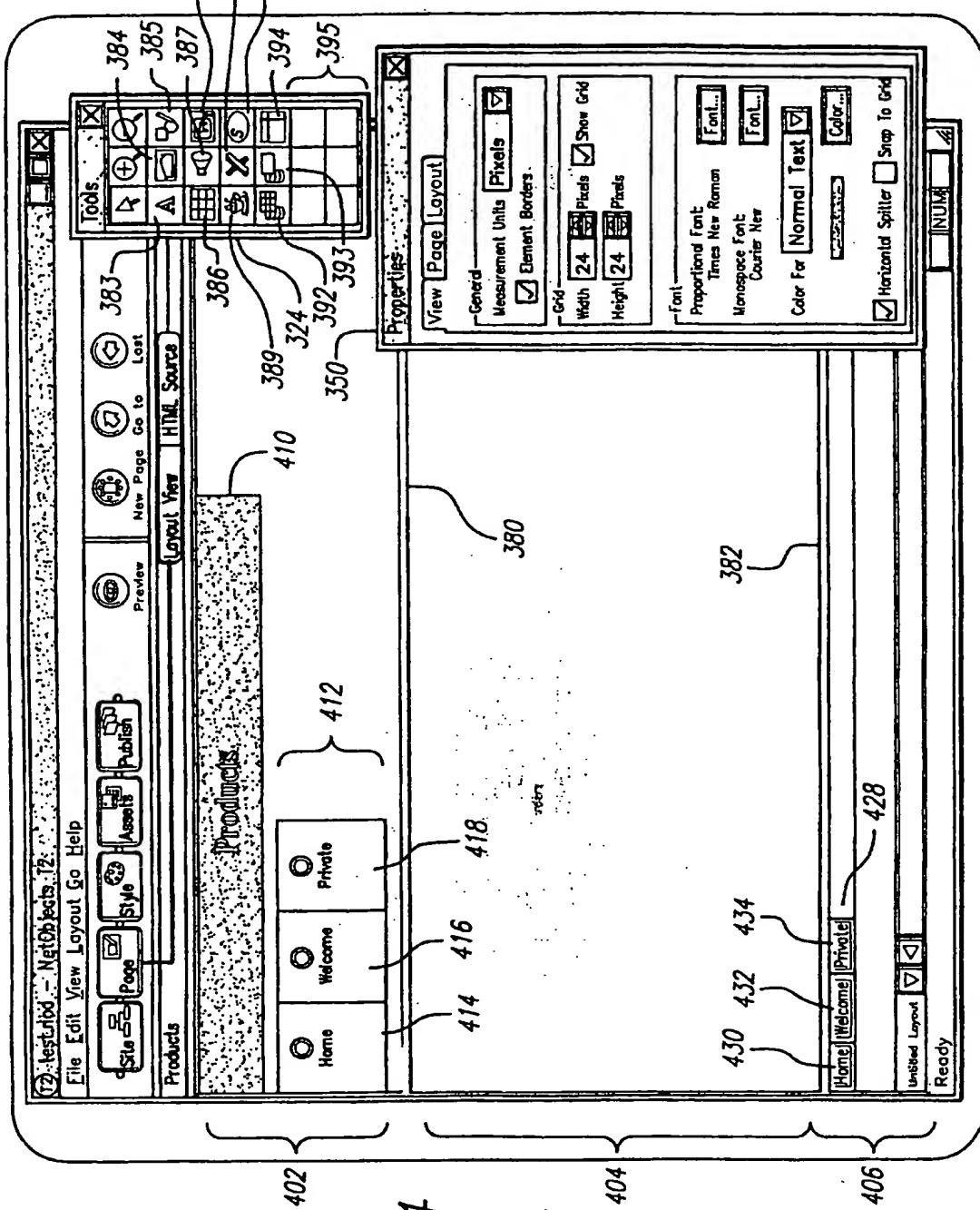


FIG. 4

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5/43

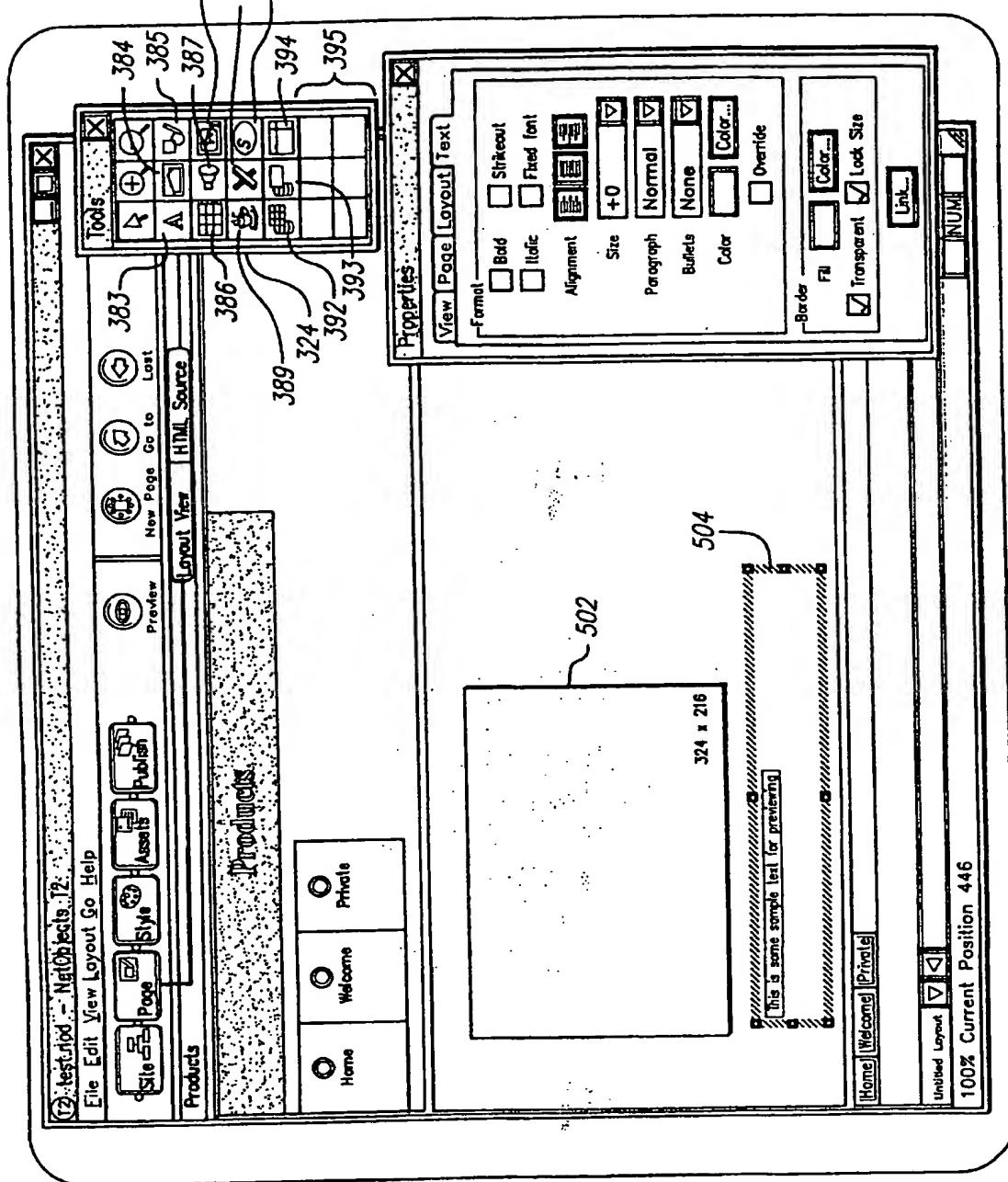


FIG. 5

SUBSTITUTE SHEET (RULE 26)

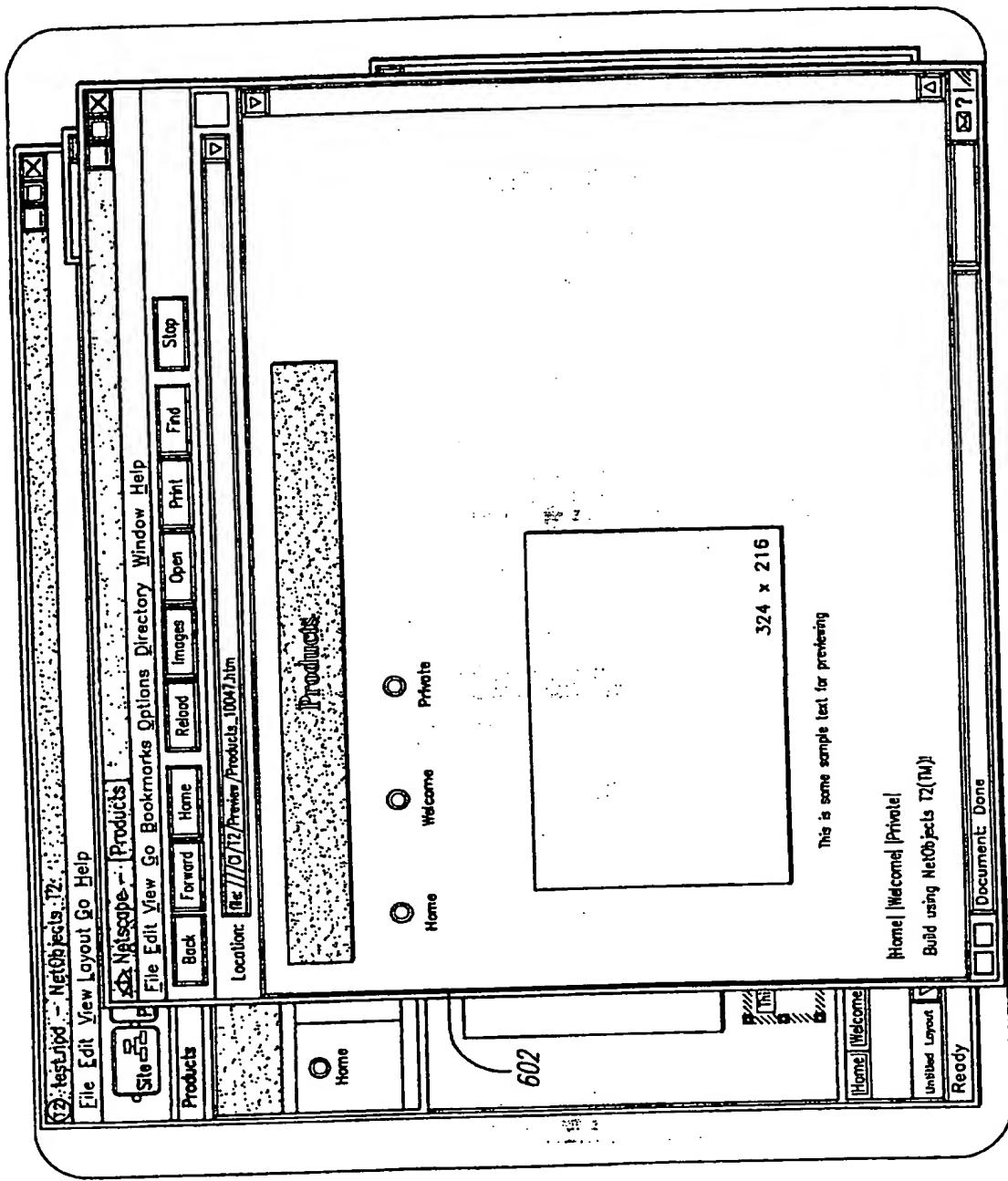
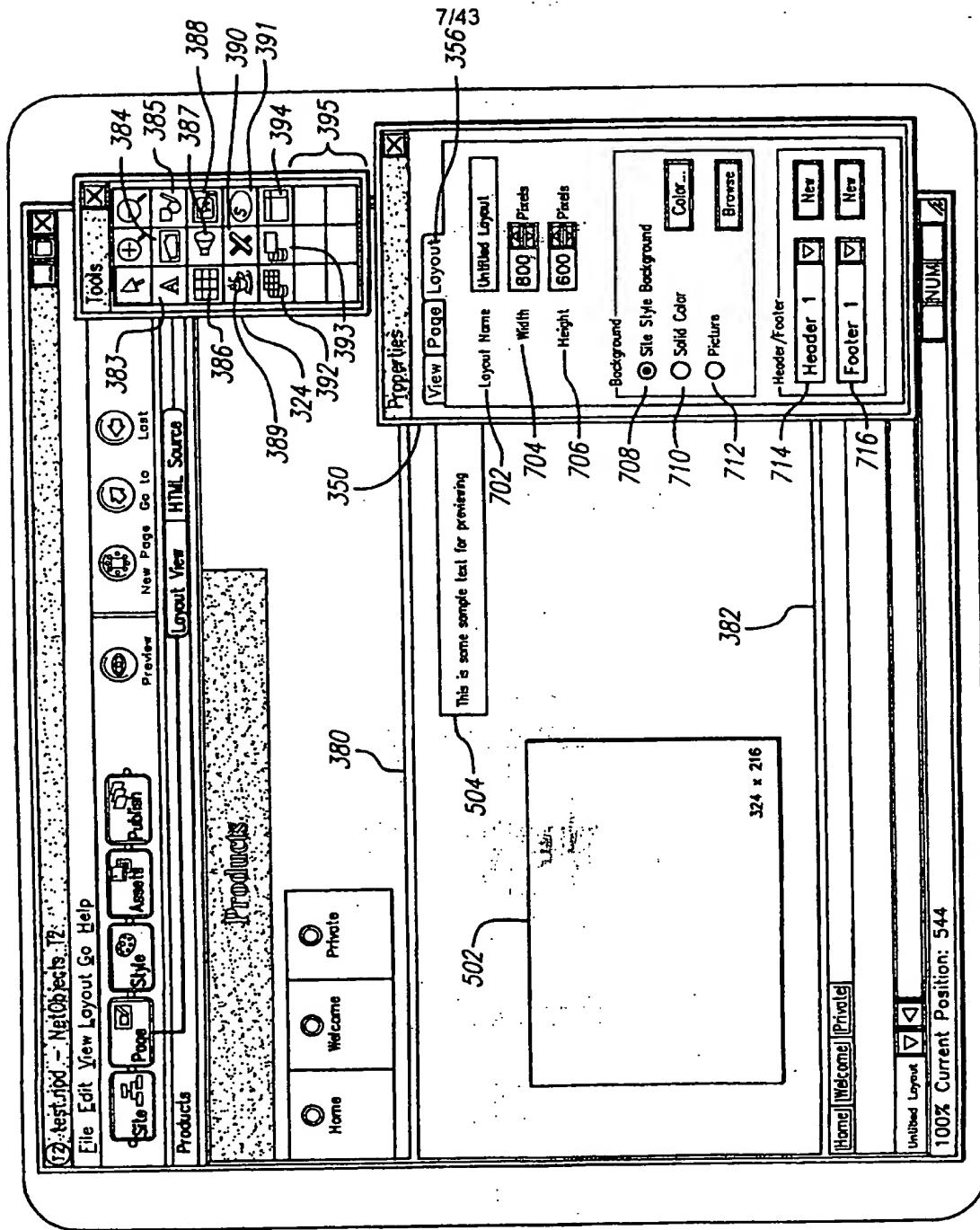


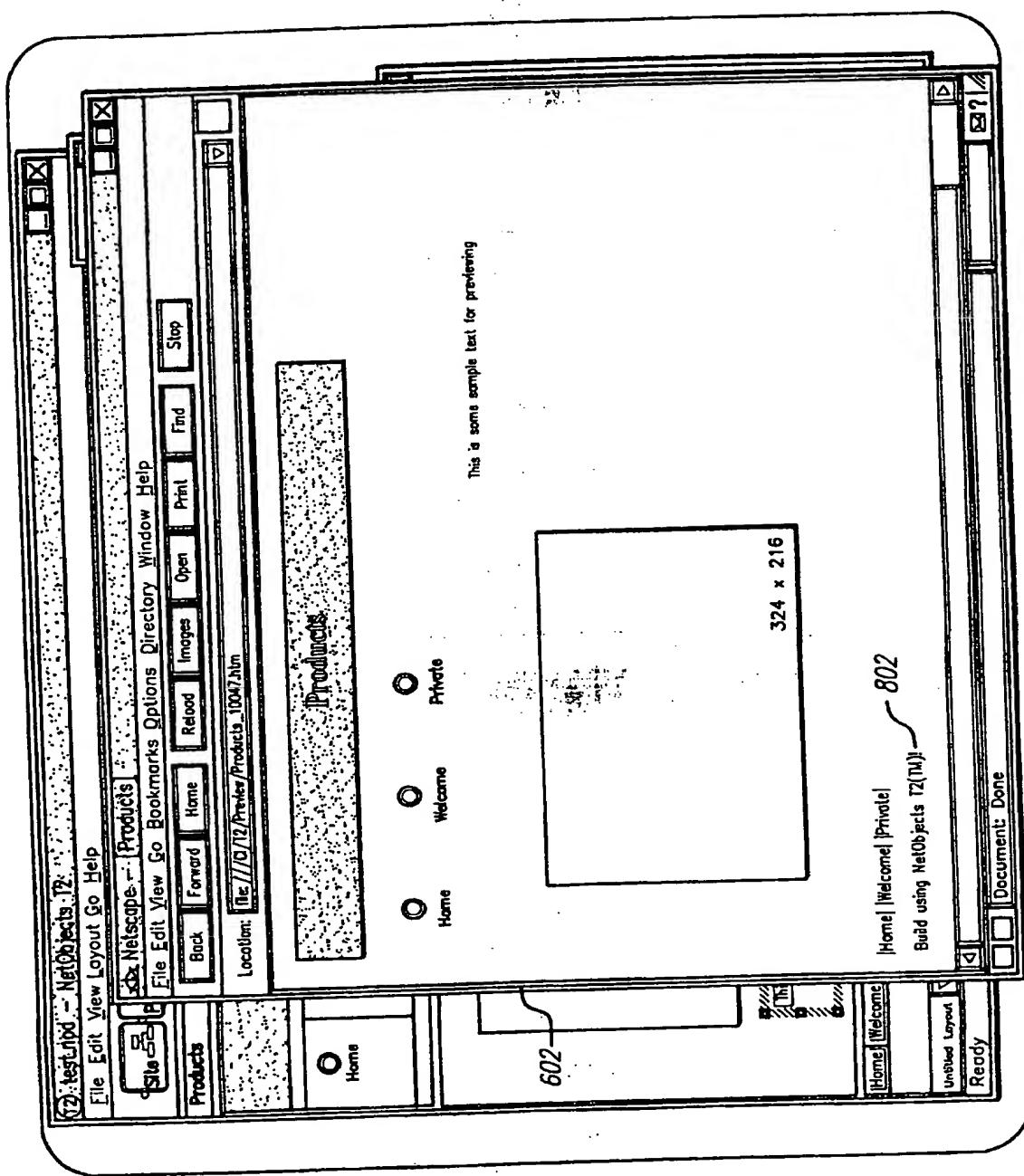
FIG. 6

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7

SUBSTITUTE SHEET (RULE 26)

8
FIG.

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9/43

FIG. 9(a)

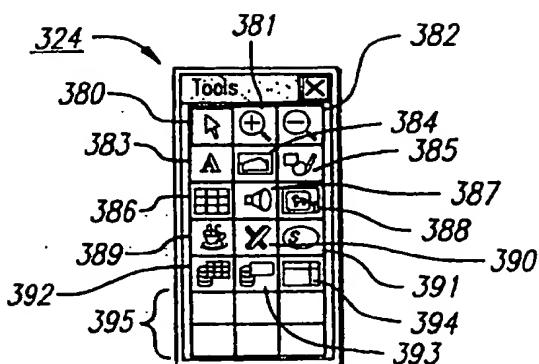


FIG. 9(b)

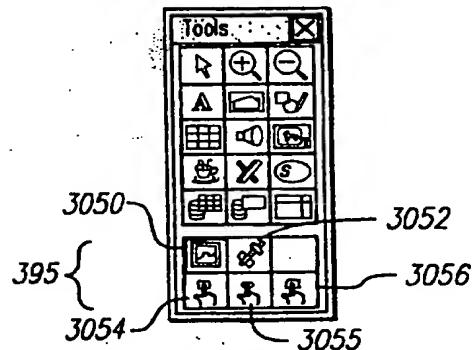


FIG. 9(c)

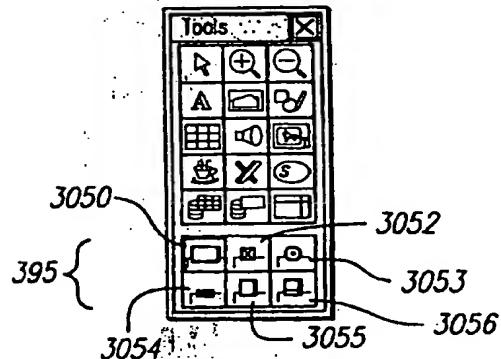
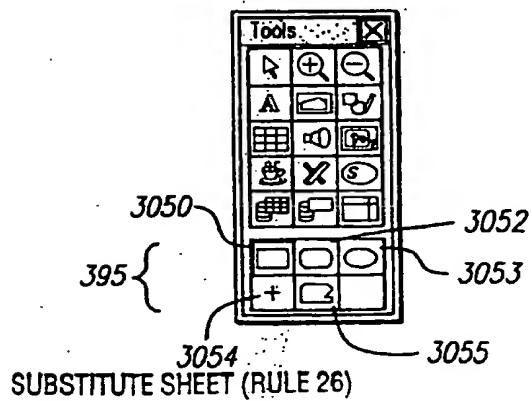


FIG. 9(d)



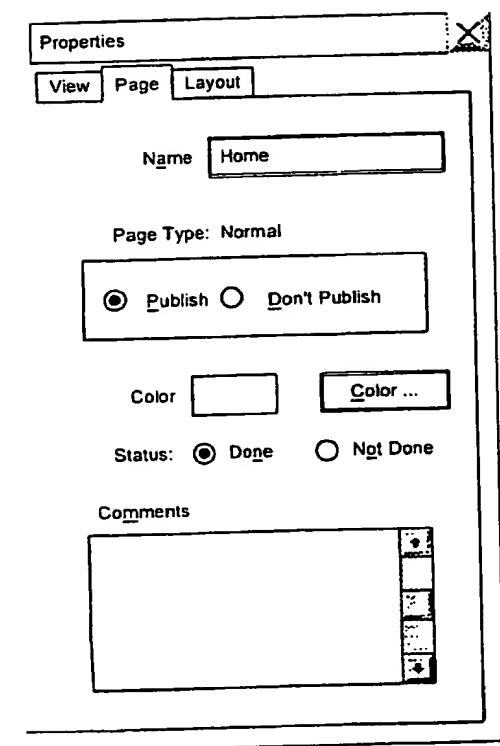


Fig. 10(a)

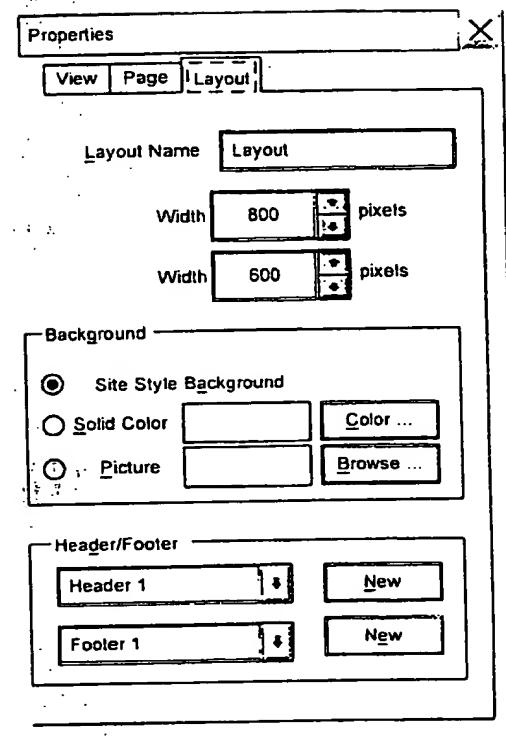


Fig. 10(b)

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11/43

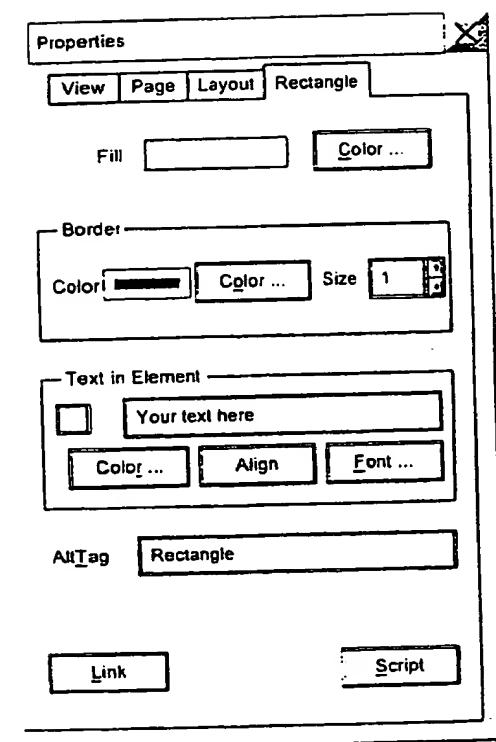


Fig. 10(c)

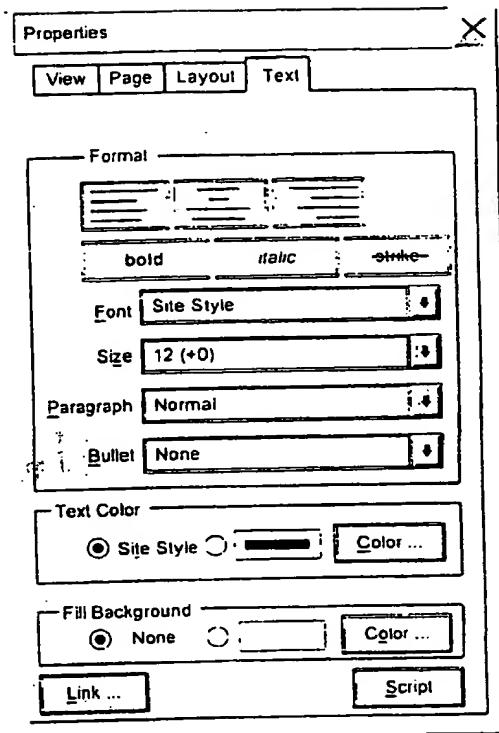


Fig. 10(d)

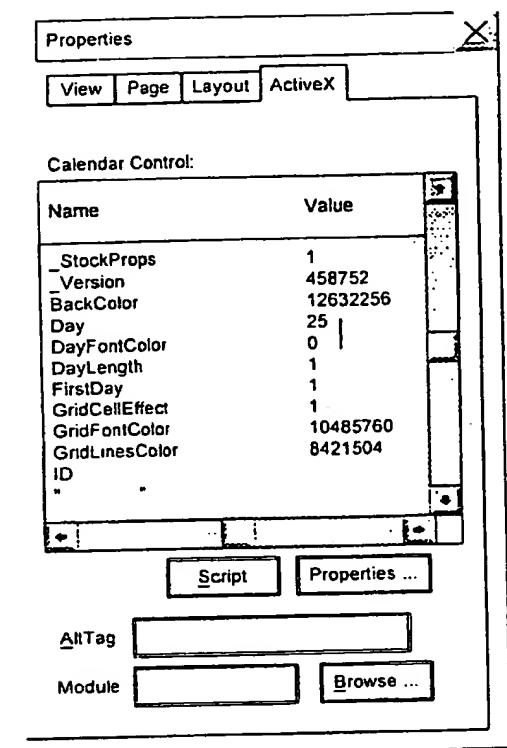


Fig. 10(e)

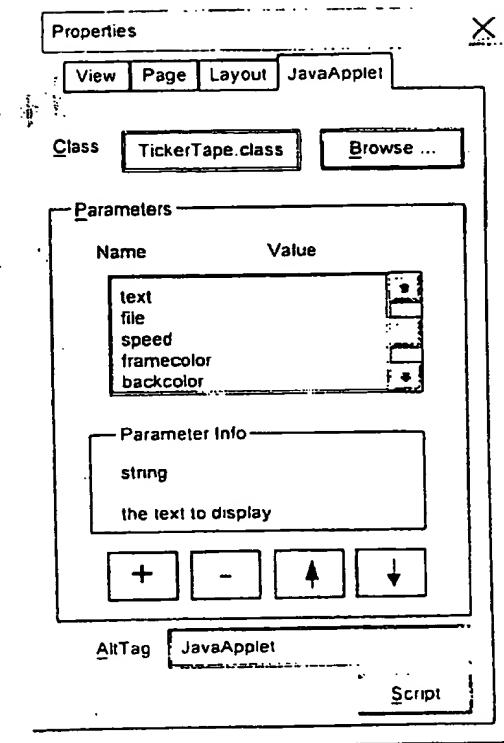


Fig. 10(f)

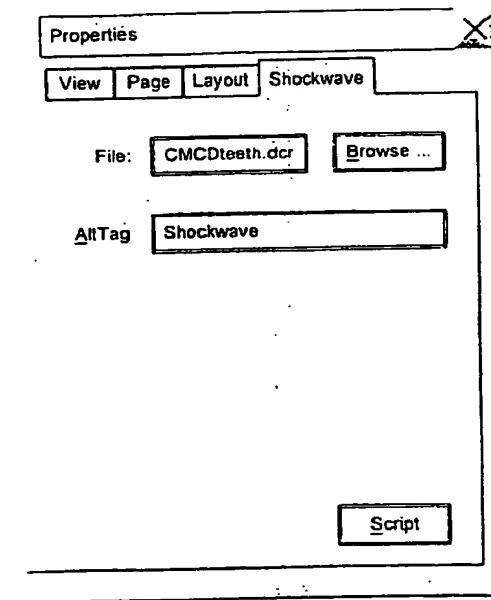


Fig. 10(g)

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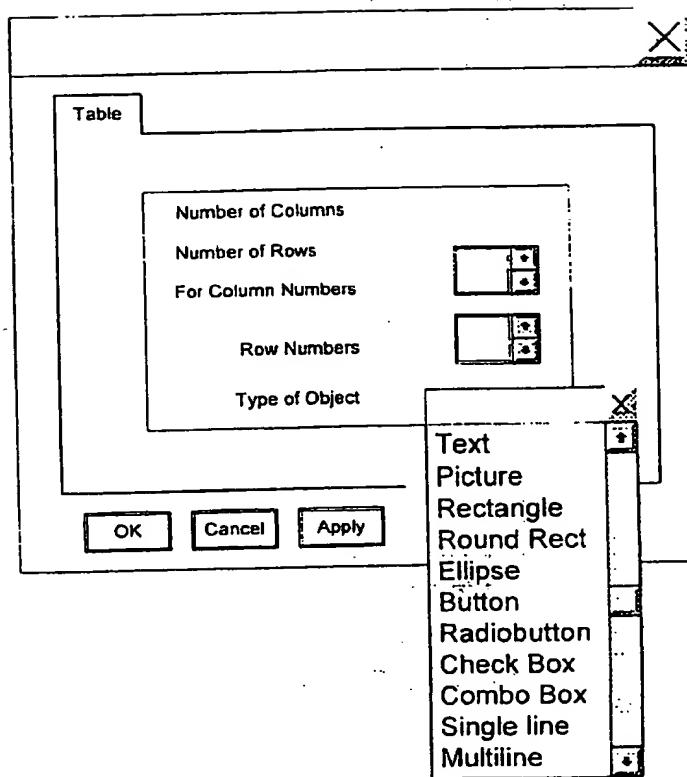


Fig. 10(h)

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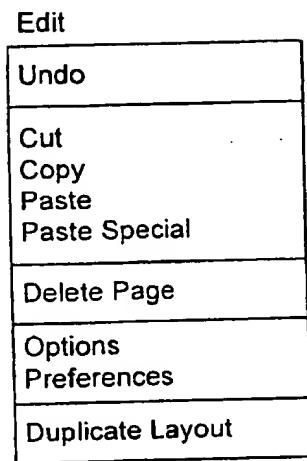


FIG. 11(a)

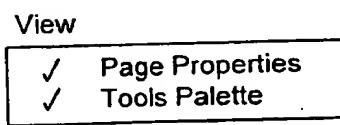


FIG. 11(b)

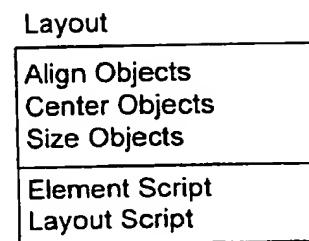


FIG. 11(c)

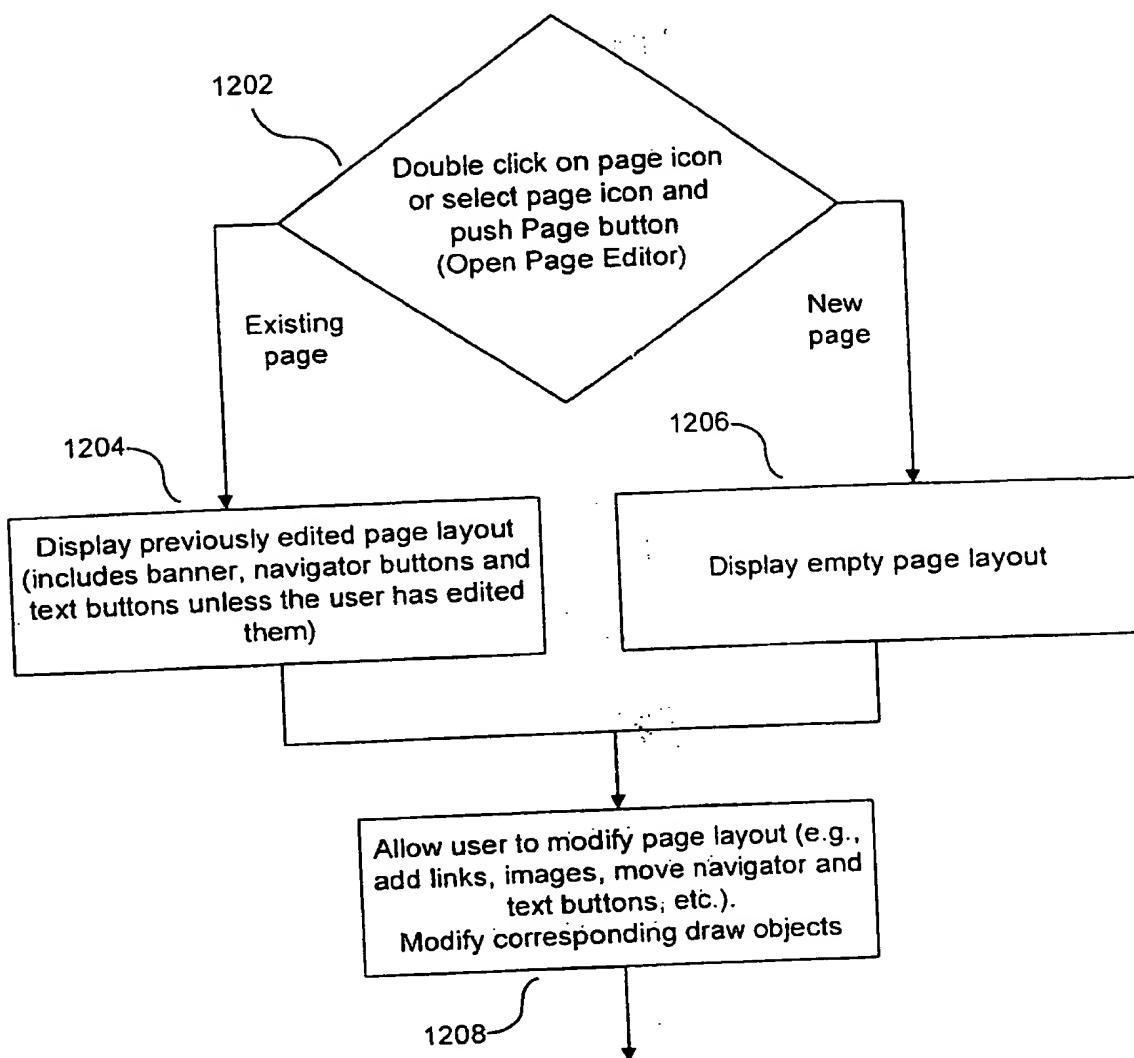
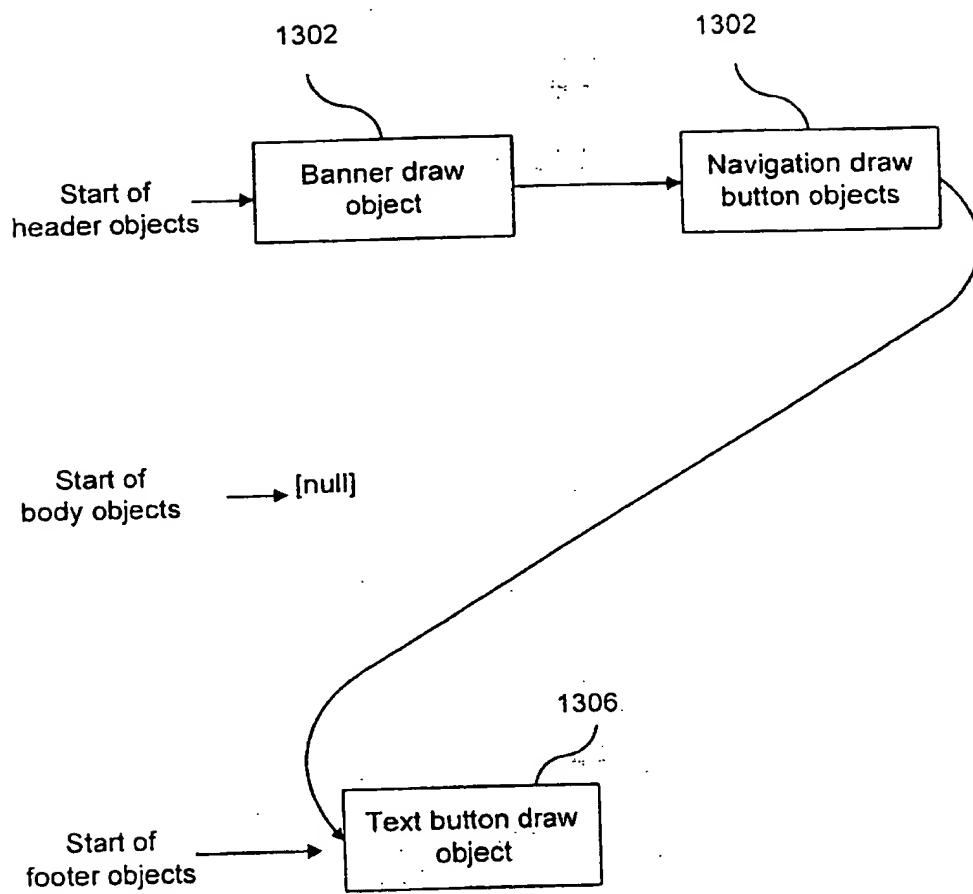
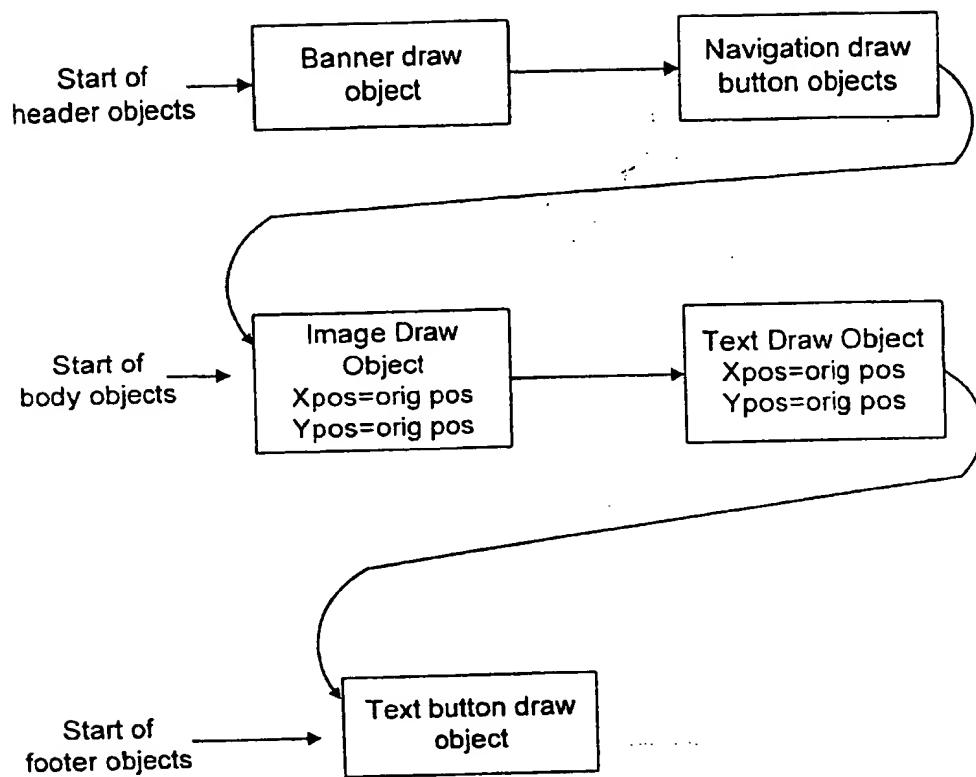


Fig. 12

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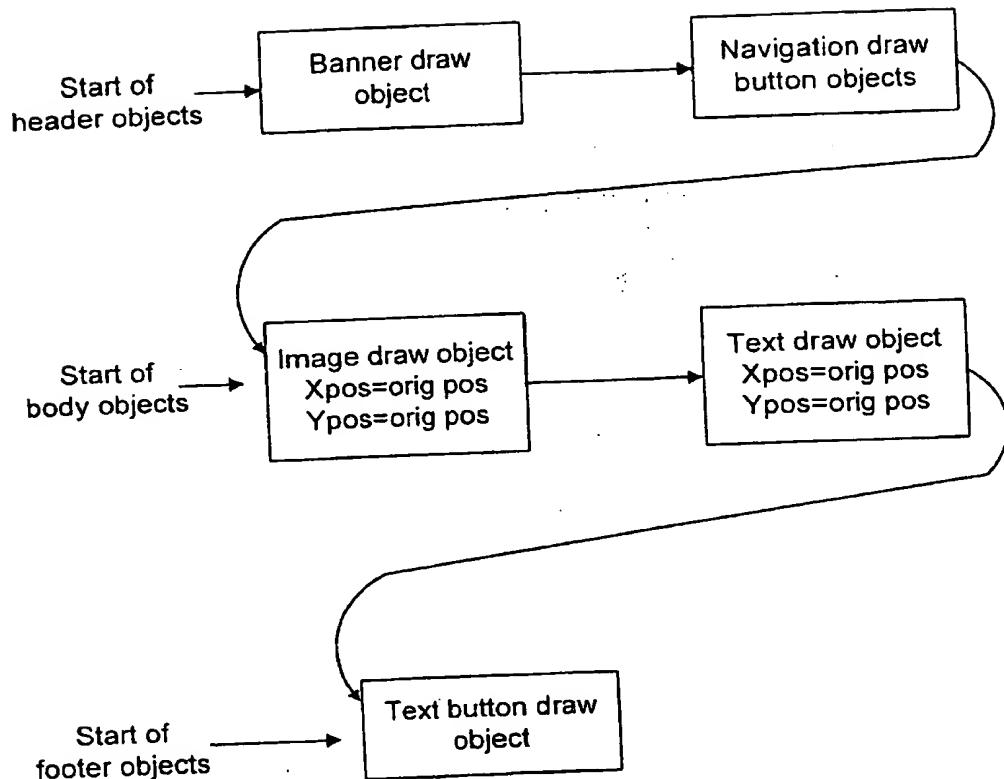


Initial Draw Objects
Fig. 13



Draw objects before moving text display element

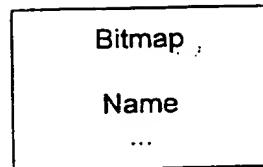
Fig. 14



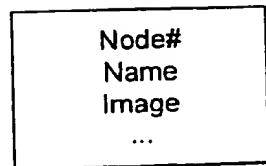
Draw objects after moving text display element
Fig. 15

SUBSTITUTE SHEET (RULE 26)

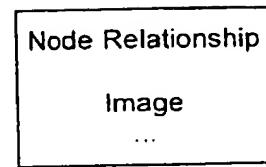
19/43



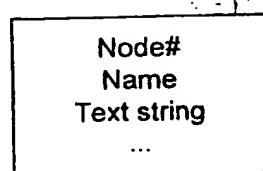
Banner
Fig. 16(a)



Navigator Button
Fig. 16(b)



Navigator Button
Fig. 16(c)



Text Navigator
Button
Fig. 16(d)

SUBSTITUTE SHEET (RULE 26)

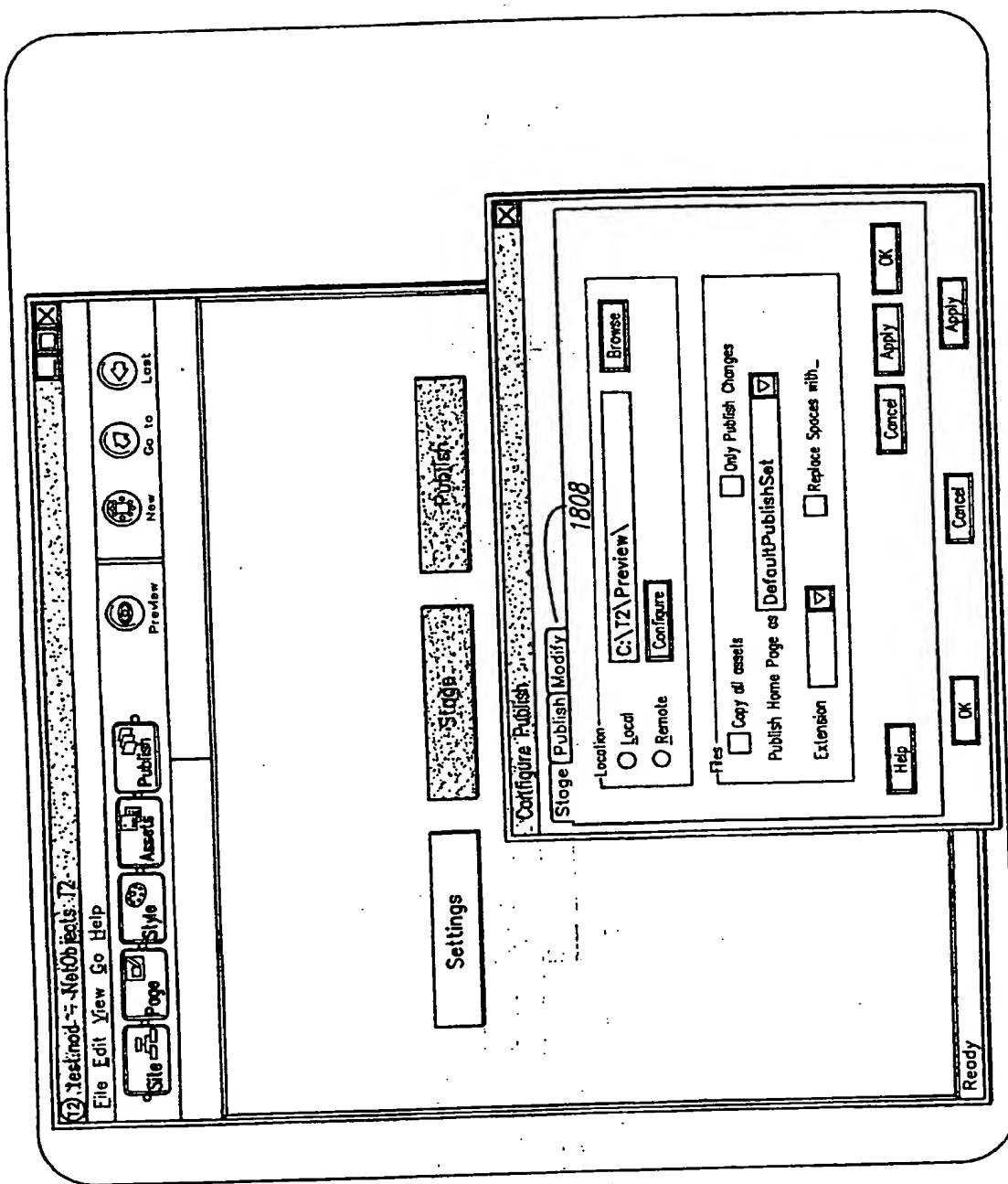


FIG. 17

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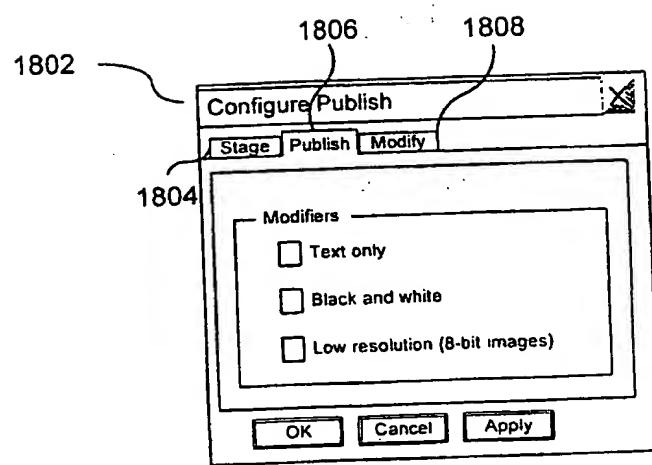
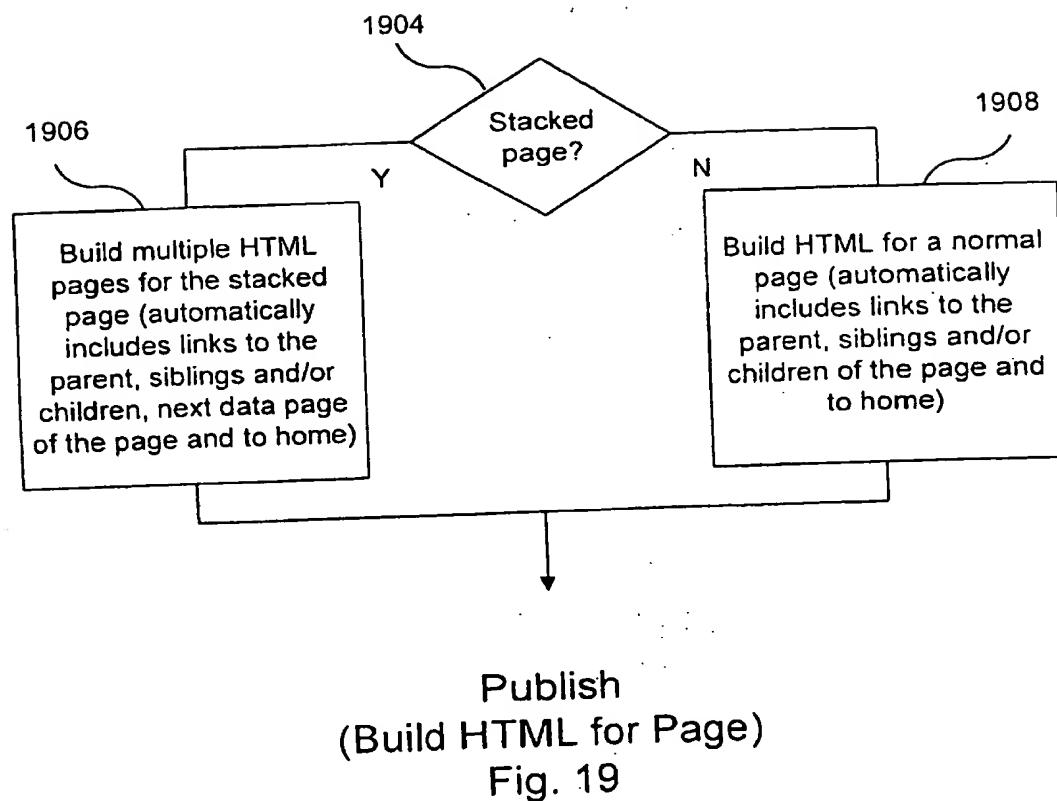
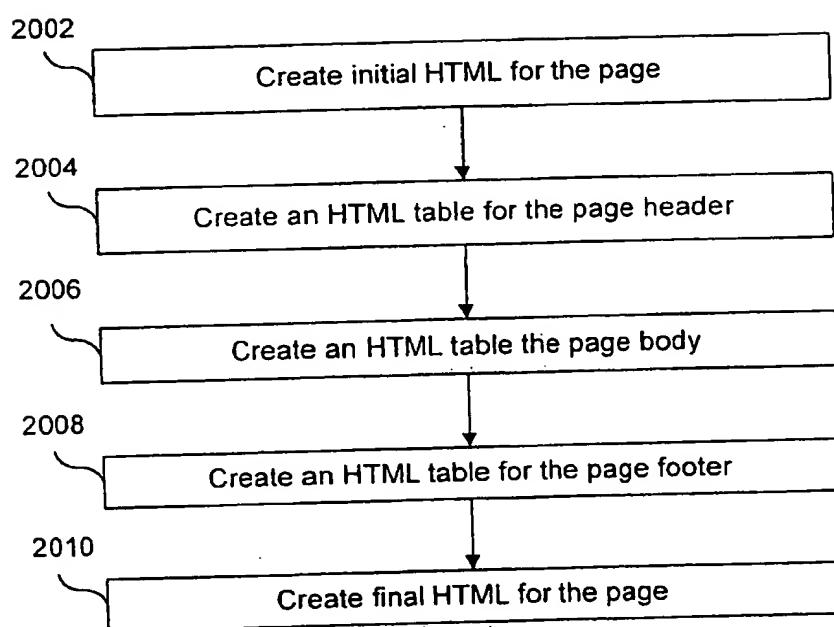


FIG. 18

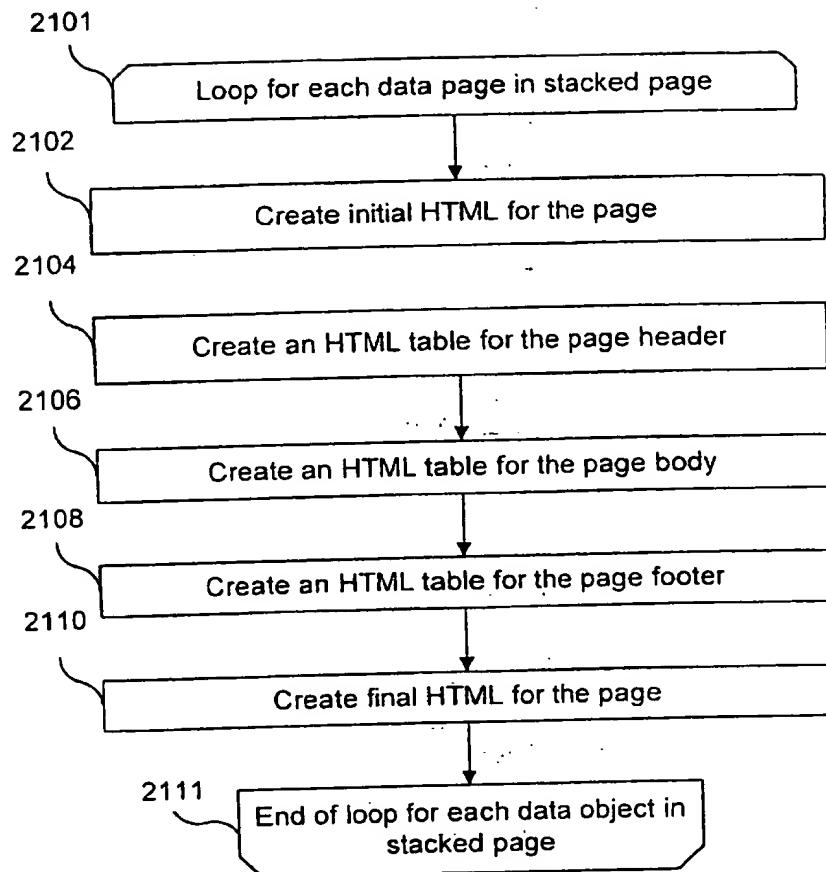
SUBSTITUTE SHEET (RULE 26)



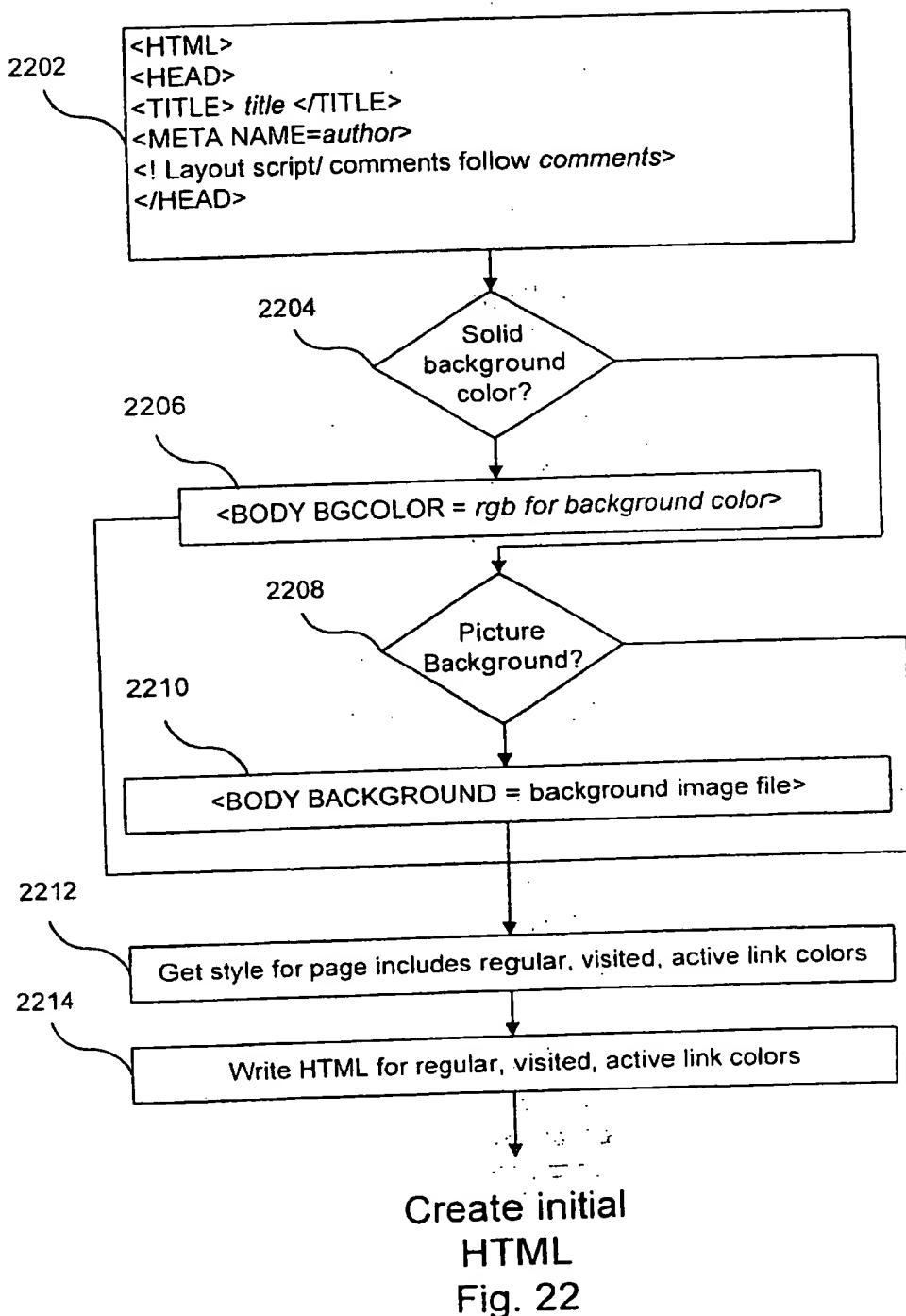
SUBSTITUTE SHEET (RULE 26)



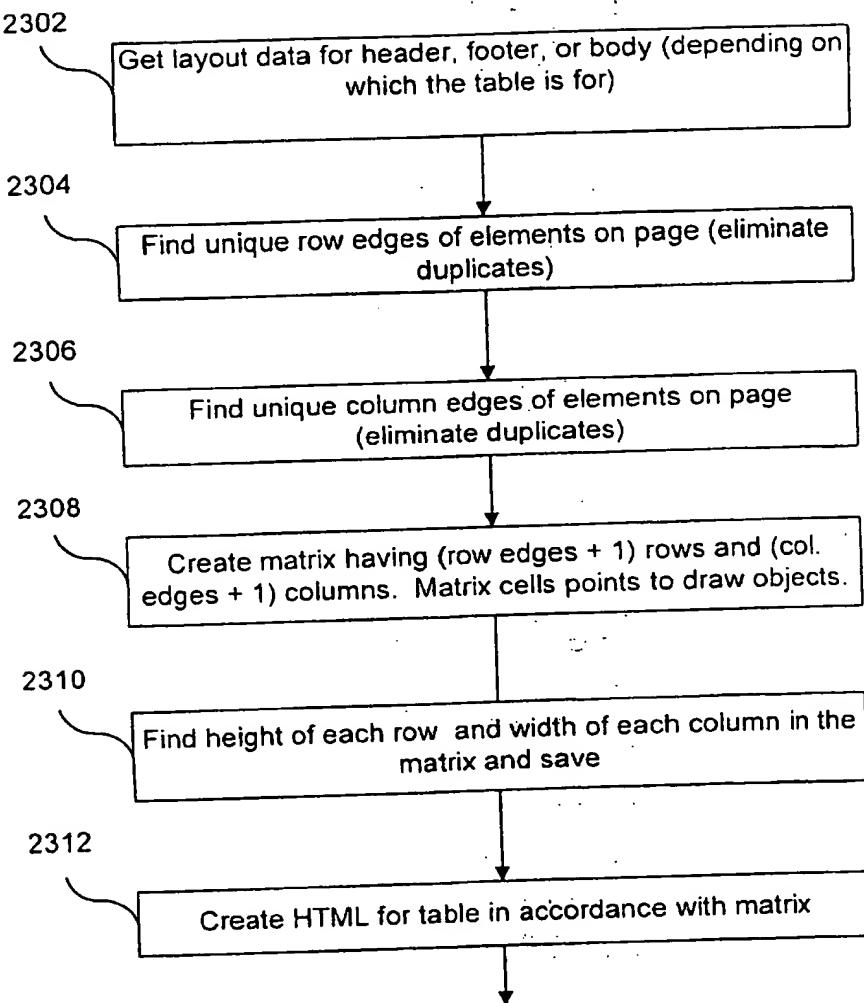
Build a
Normal Page
Fig. 20



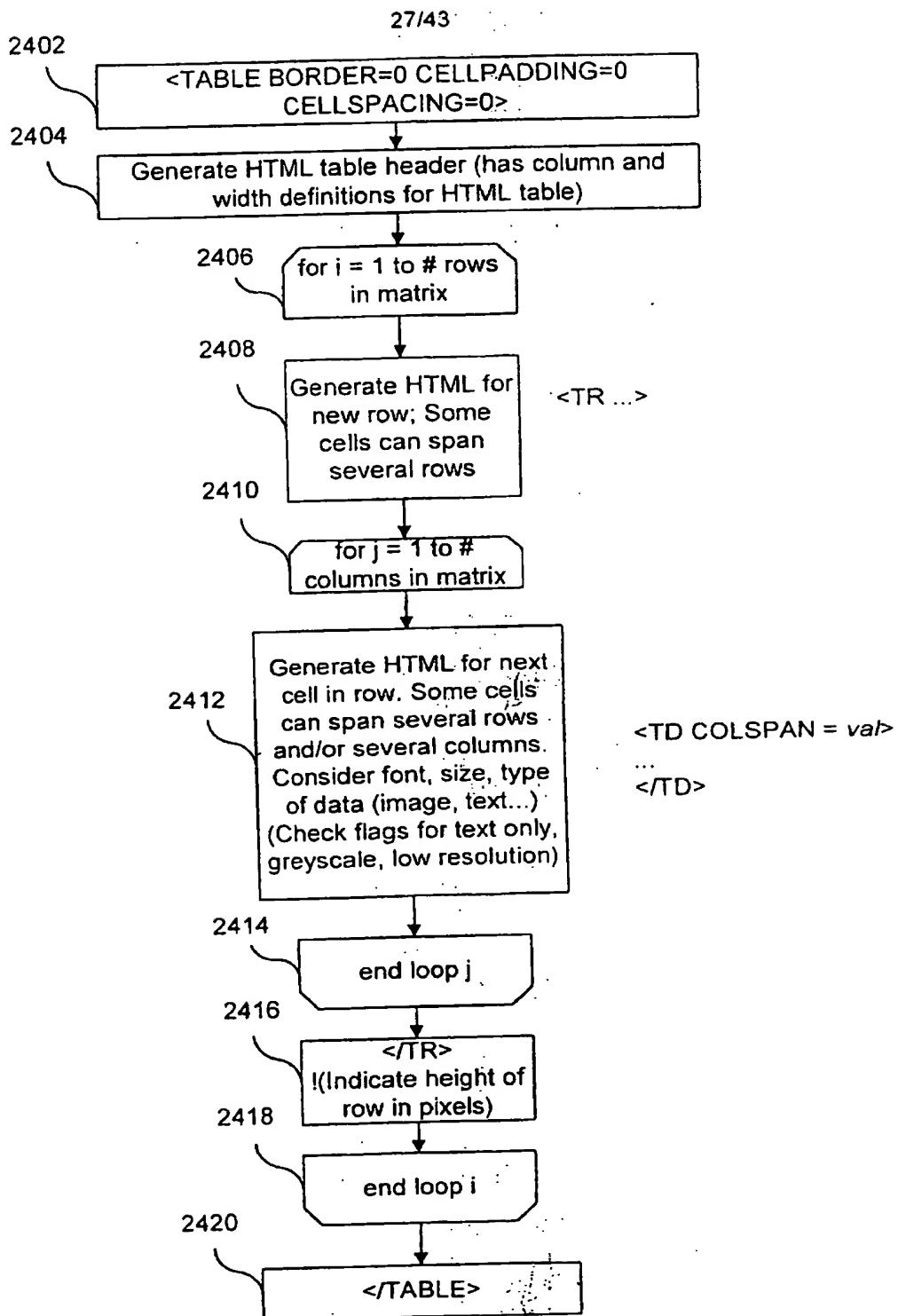
Build a
Stacked Page
Fig. 21



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Build an HTML Table
Fig. 23



Generation of HTML for an HTML table in
accordance with matrix
SUBSTITUTE SHEET (RULE 26)

FIG. 24

2502

```
<P> <A HREF = netobjects homepage URL>
    <IMG SRC=link image\ BORDER=0>
</A>
</P>
</BODY>
</HTML>
```

Generate final
HTML
Fig. 25

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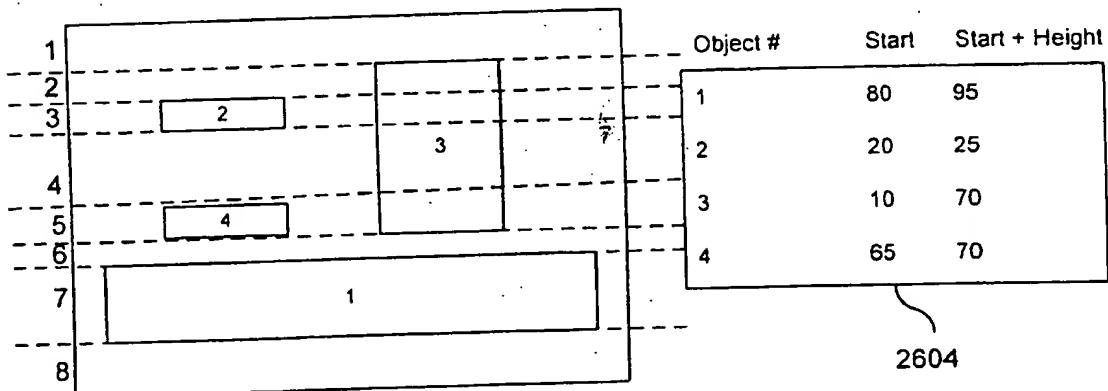
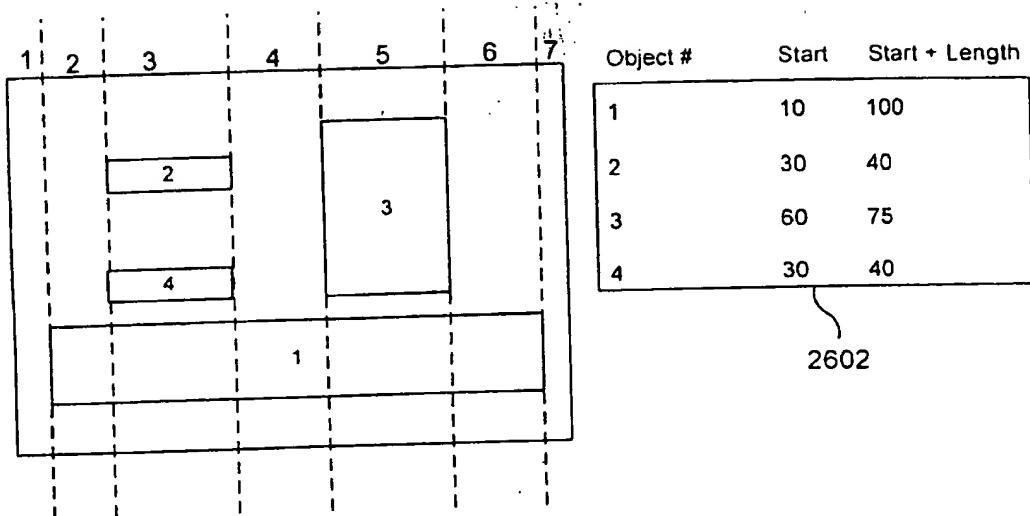


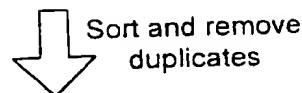
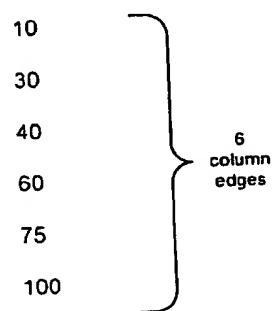
FIG. 26

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Object #	Start	Start + Length	Object #	Start	Start + Height
1	10	100	1	80	95
2	30	40	2	20	25
3	60	75	3	10	70
4	30	40	4	65	70



Column Edges



Row Edges

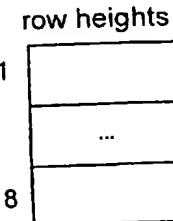
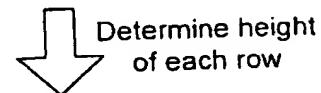
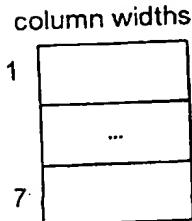
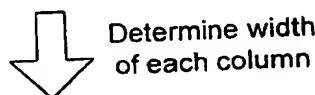
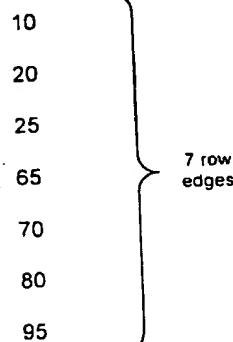


Fig. 27

SUBSTITUTE SHEET (RULE 26)

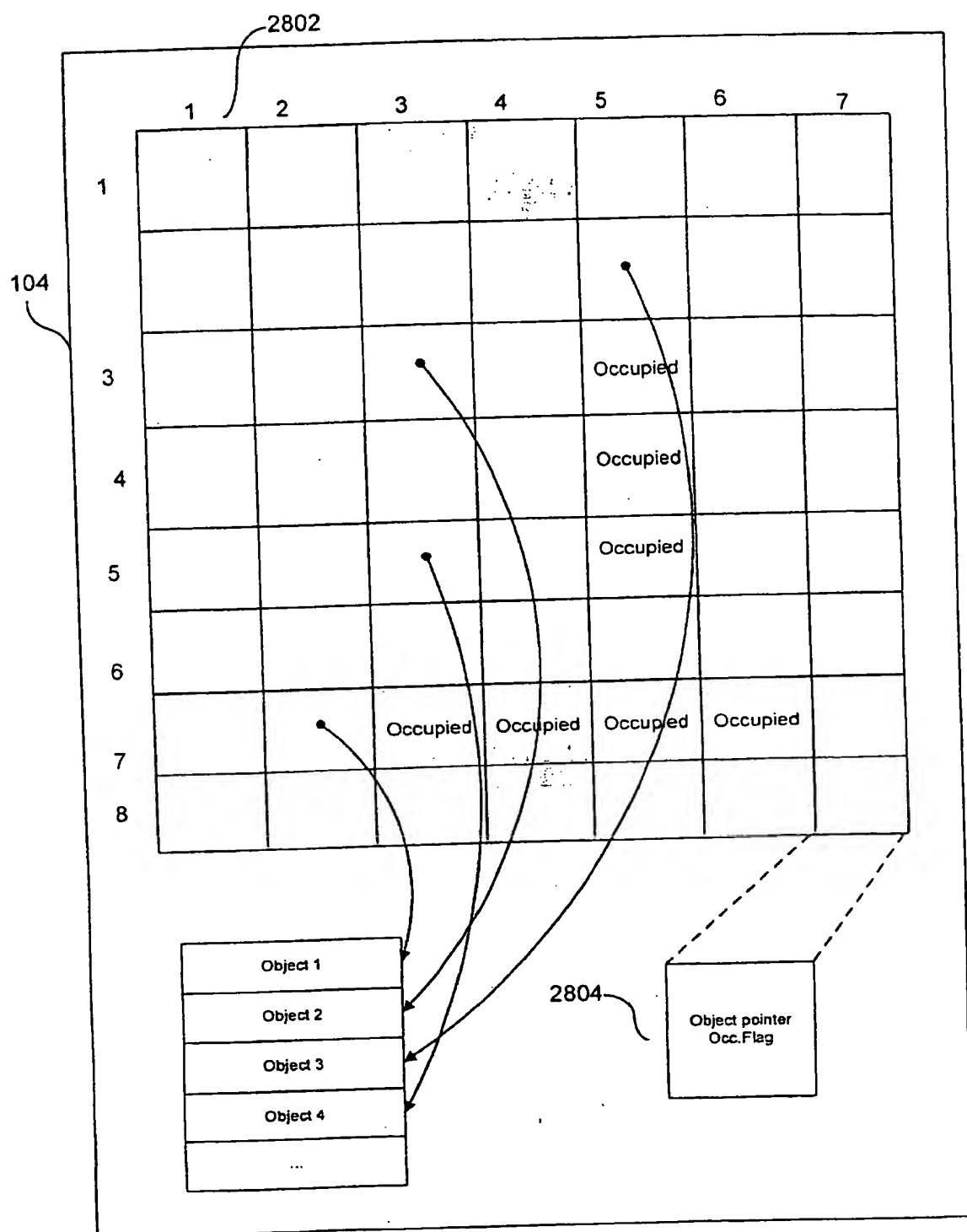


Fig. 28
SUBSTITUTE SHEET (RULE 26)

32/43

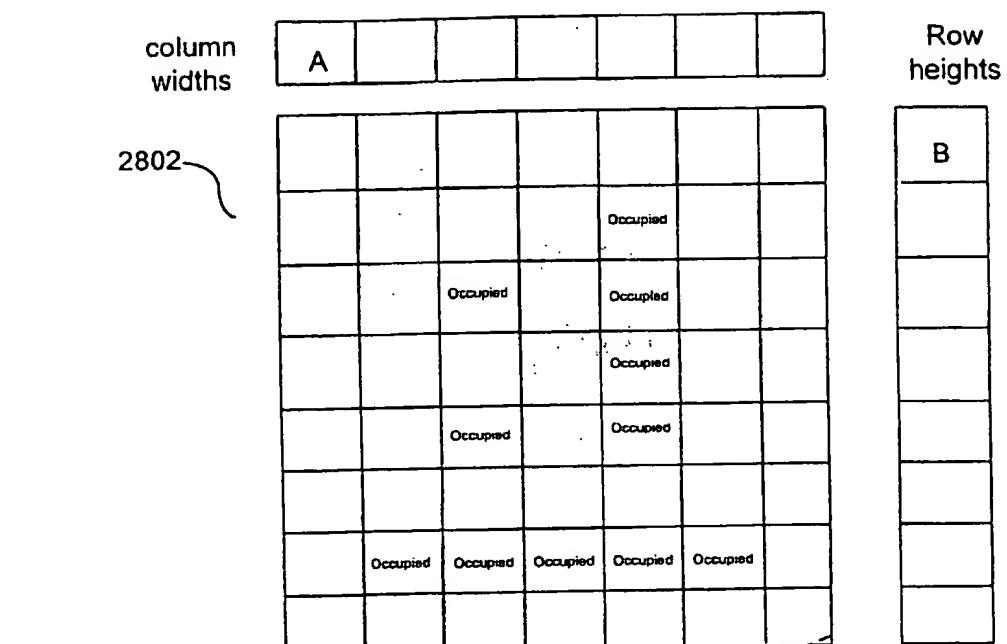
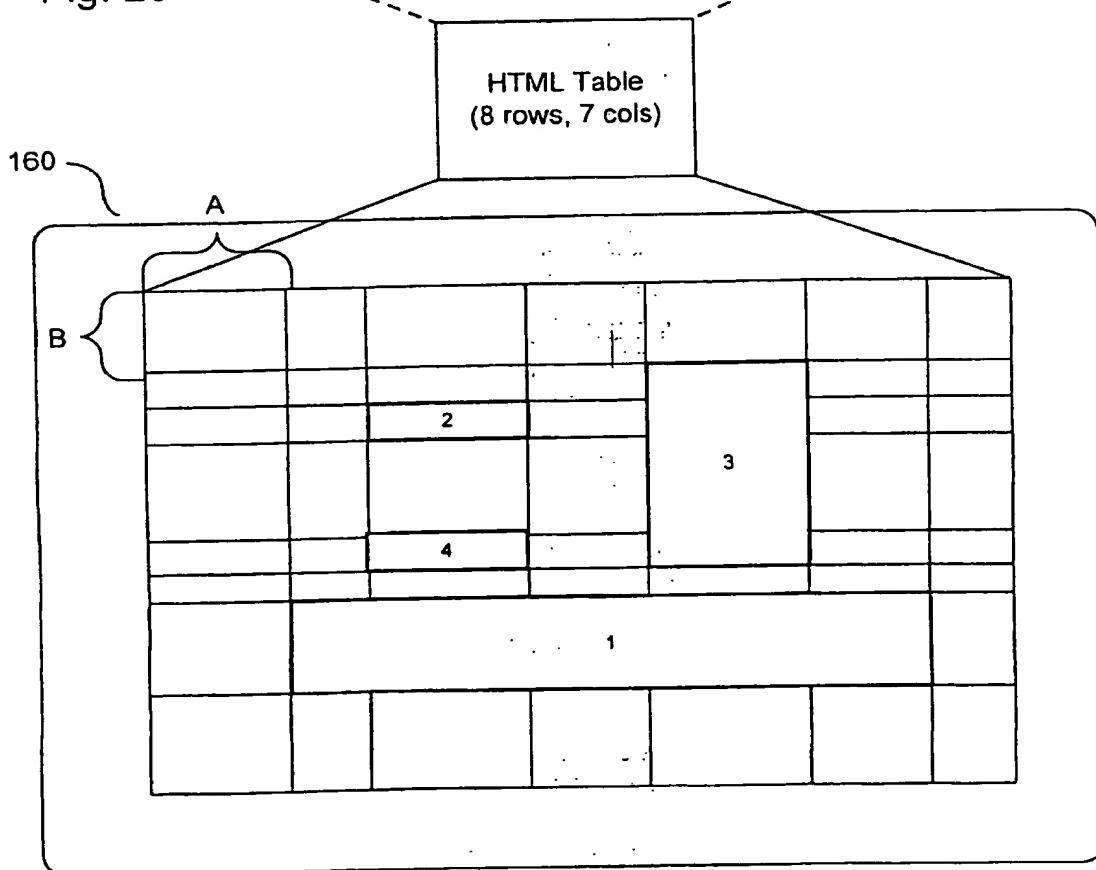


Fig. 29



SUBSTITUTE SHEET (RULE 26)

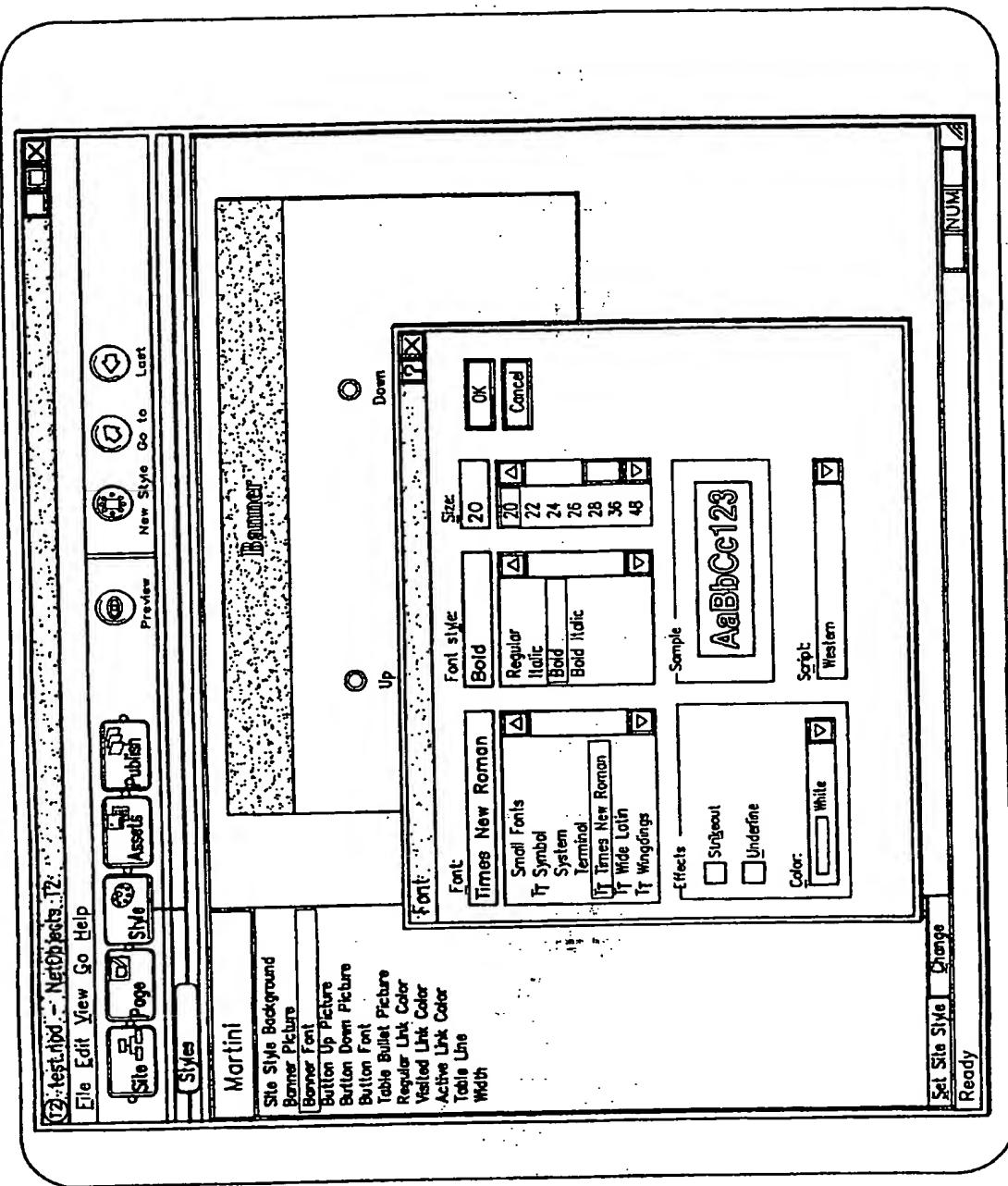


FIG. 30

SUBSTITUTE SHEET (RULE 26)

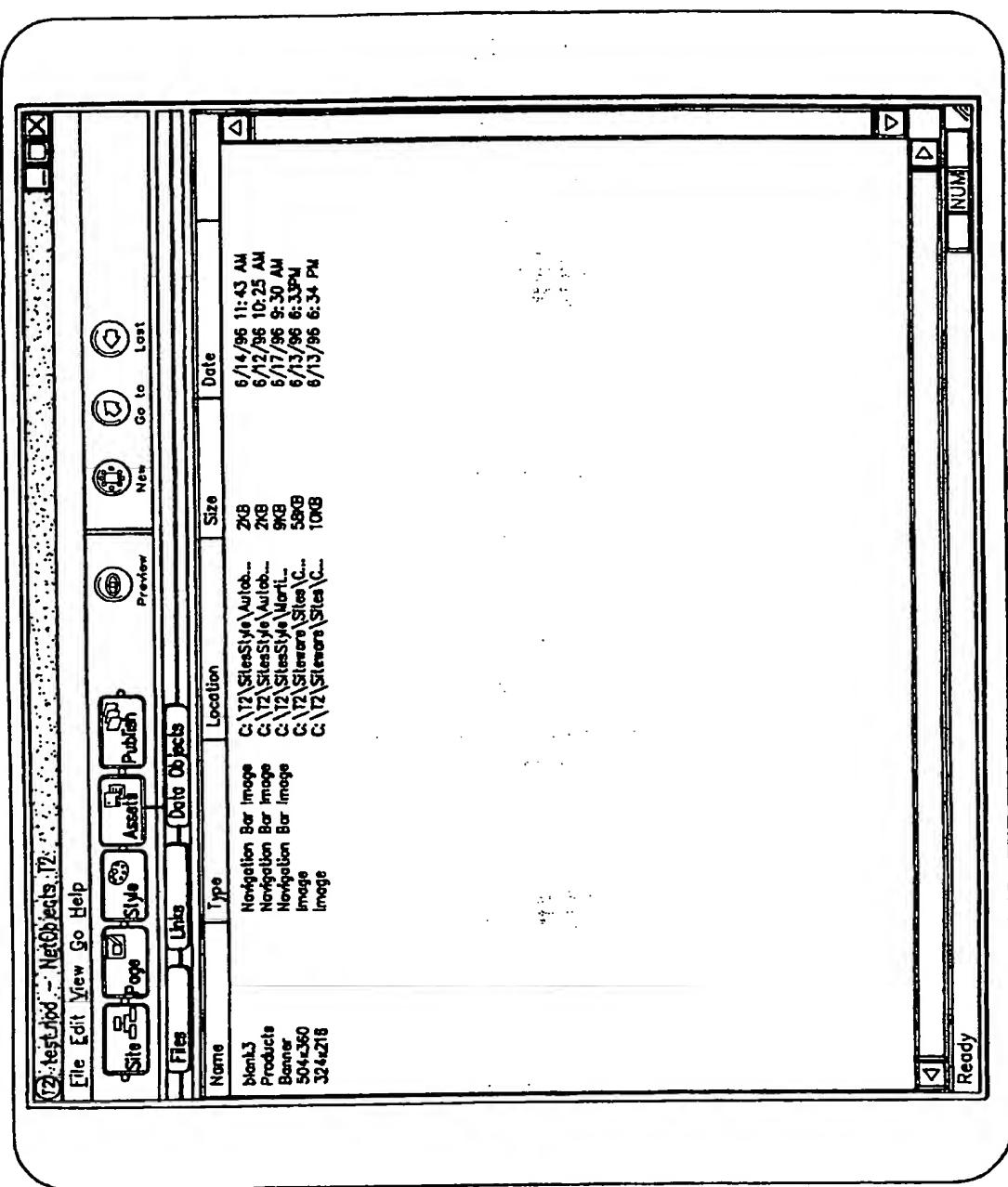


FIG. 31

SUBSTITUTE SHEET (RULE 26)

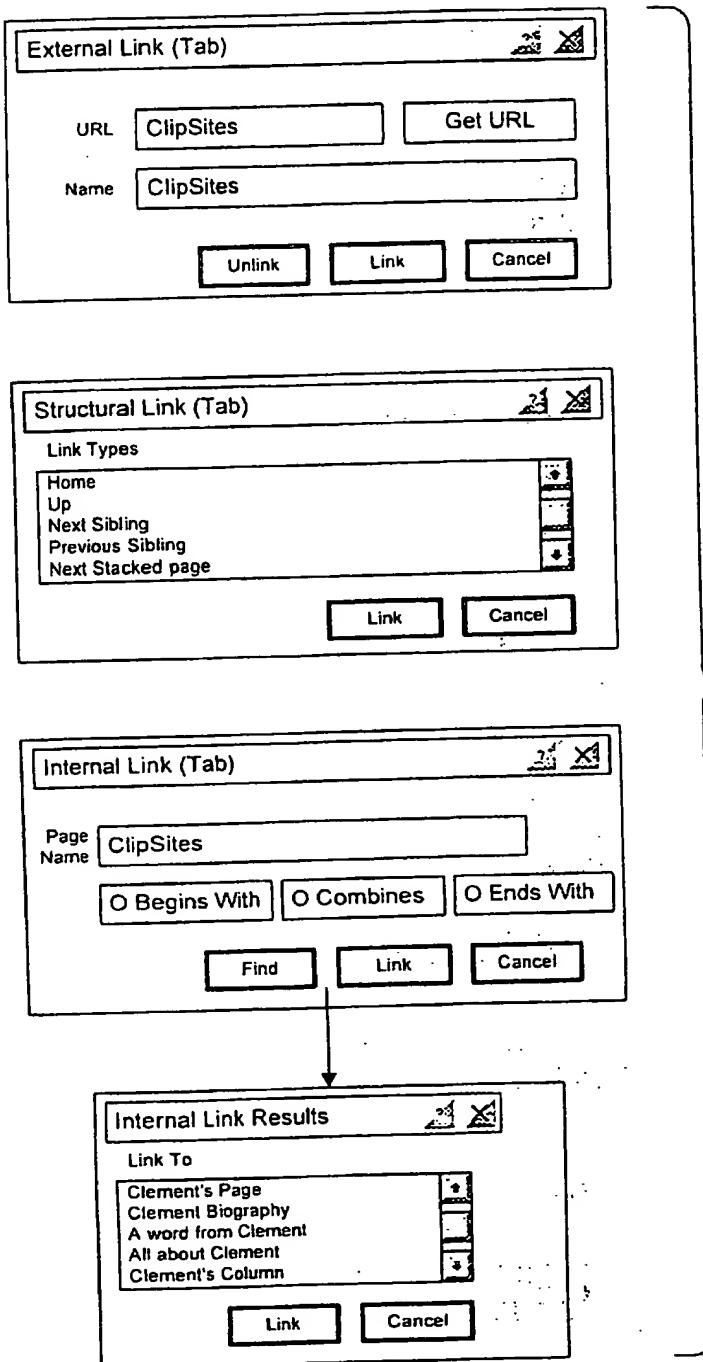


FIG. 32

SUBSTITUTE SHEET (RULE 26)

36/43

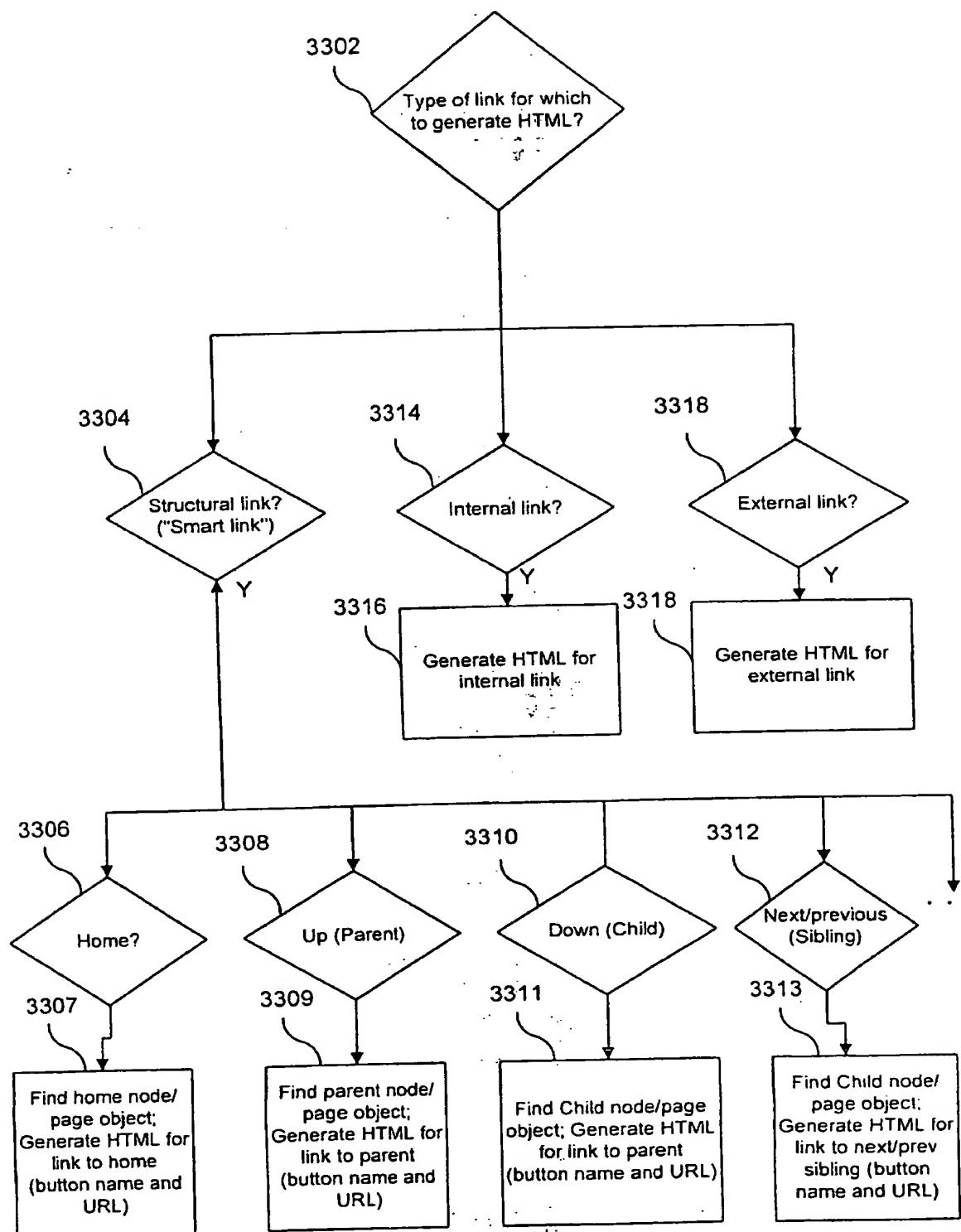
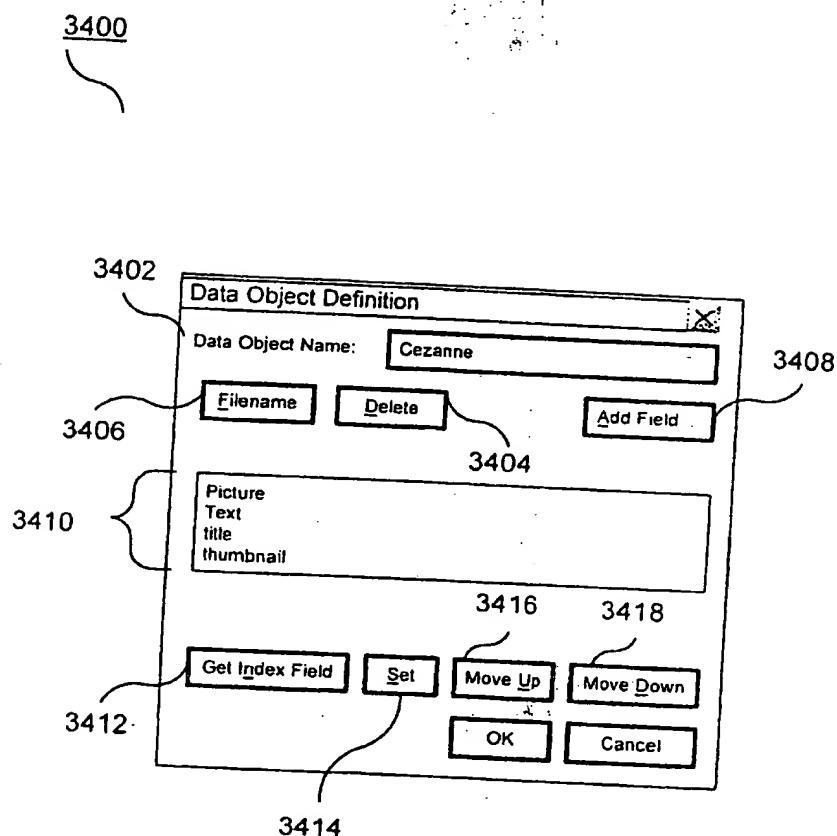


FIG. 33
SUBSTITUTE SHEET (RULE 26)

37/43



The Object Definition Dialog Box
FIG. 34

SUBSTITUTE SHEET. (RULE 26)

38/43

FIG. 35

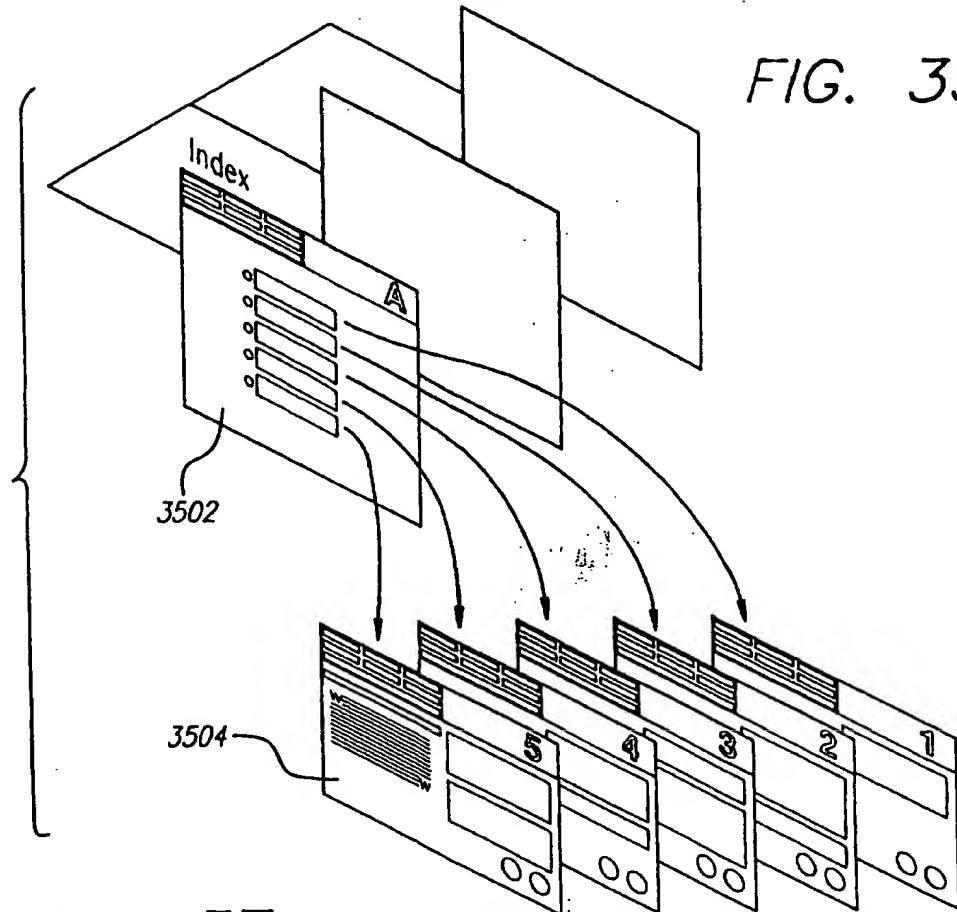
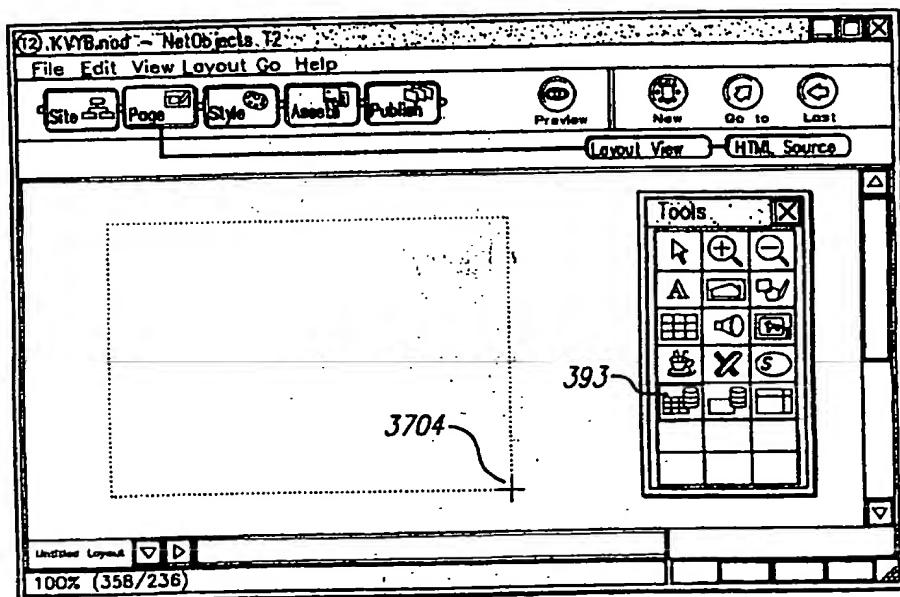


FIG. 37



SUBSTITUTE SHEET (RULE 26)

39/43

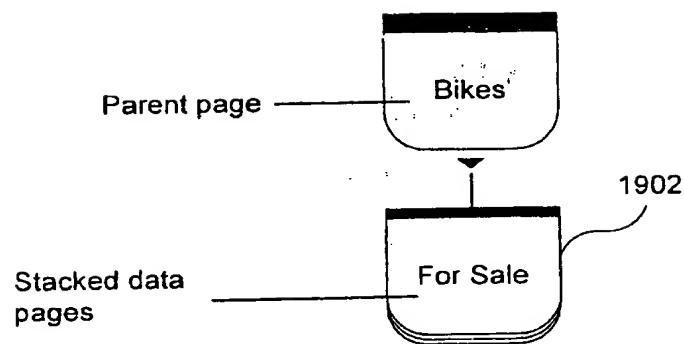


FIG. 36

SUBSTITUTE SHEET (RULE 26)

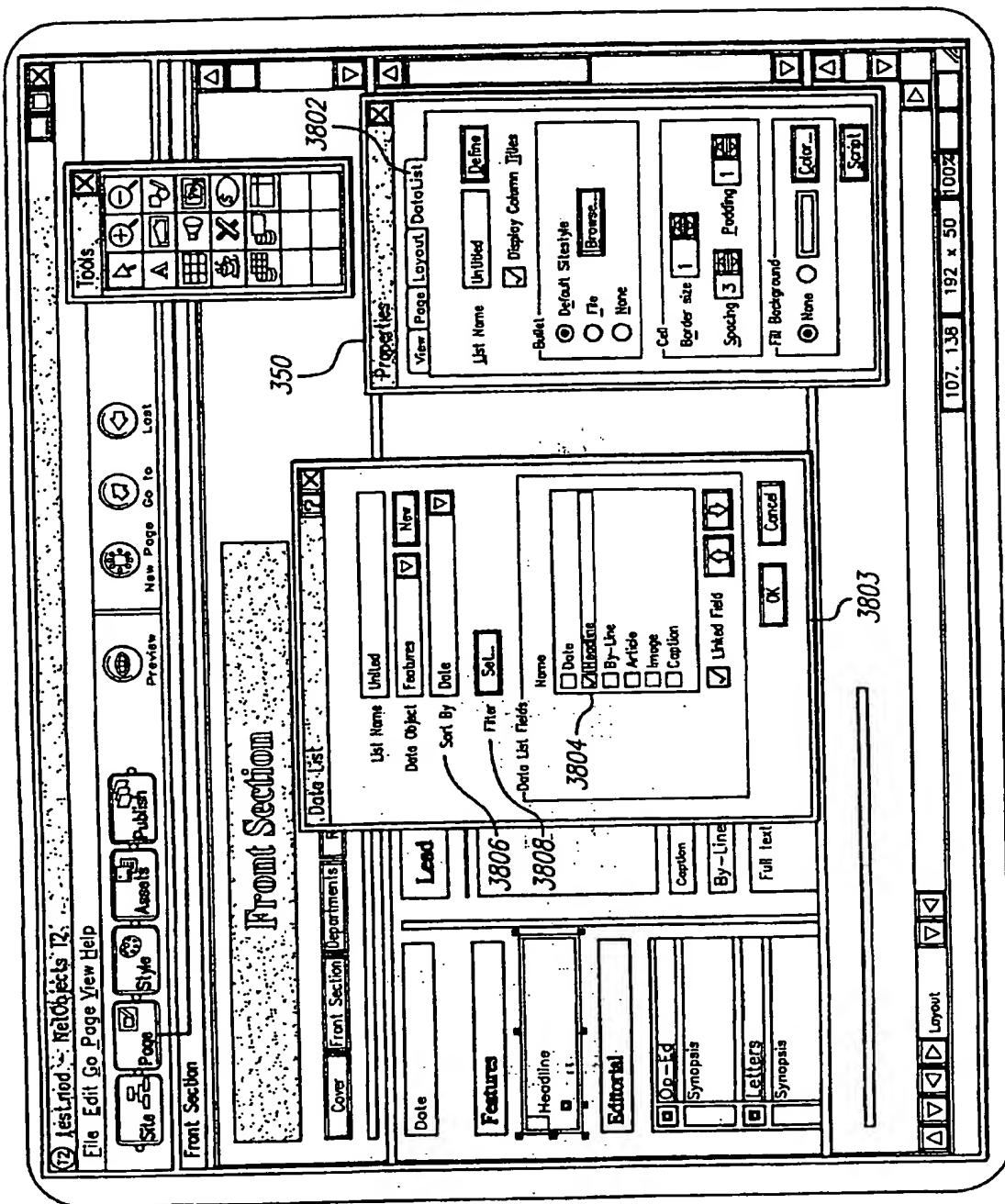


FIG. 38

SUBSTITUTE SHEET (RULE 26)

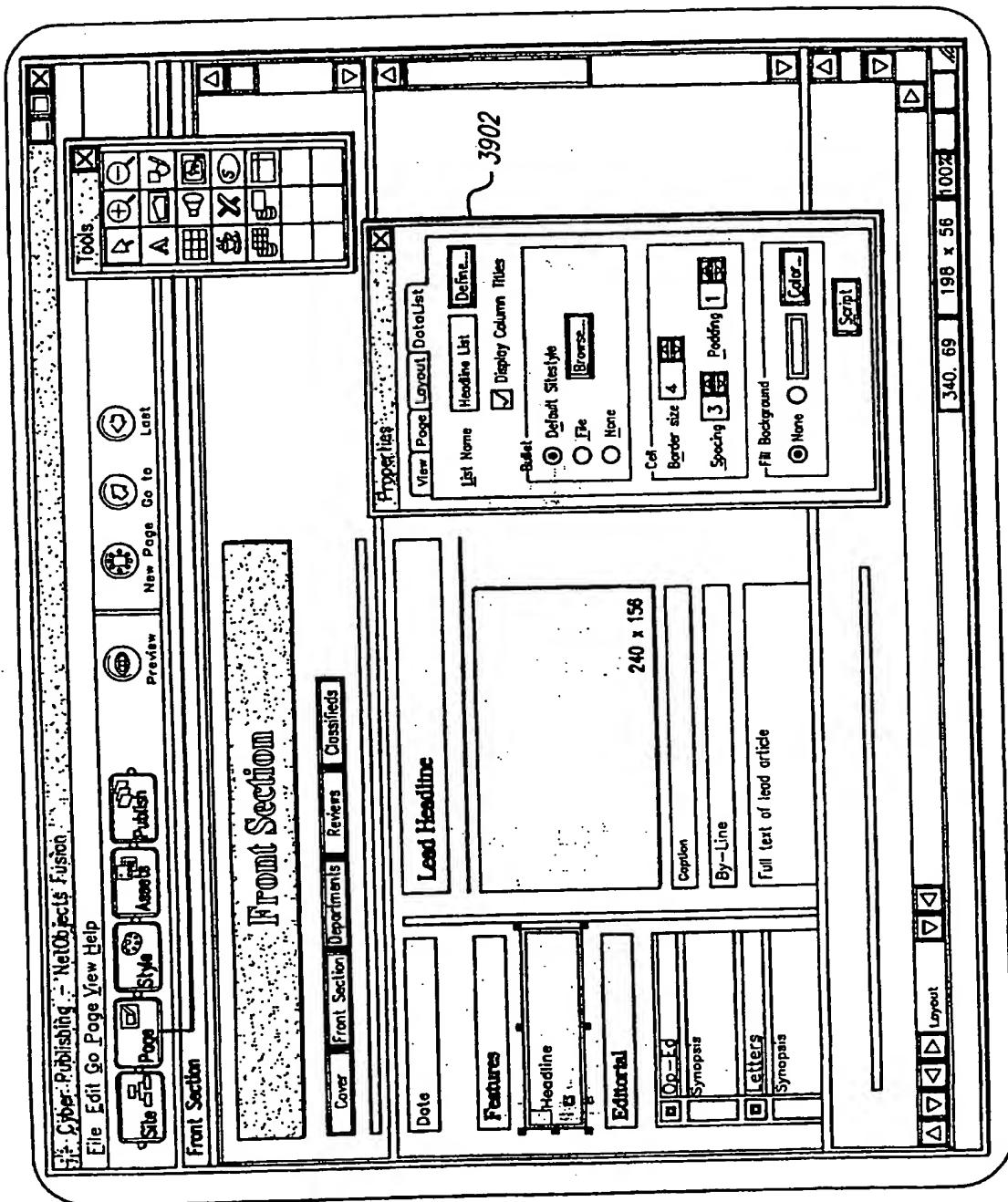
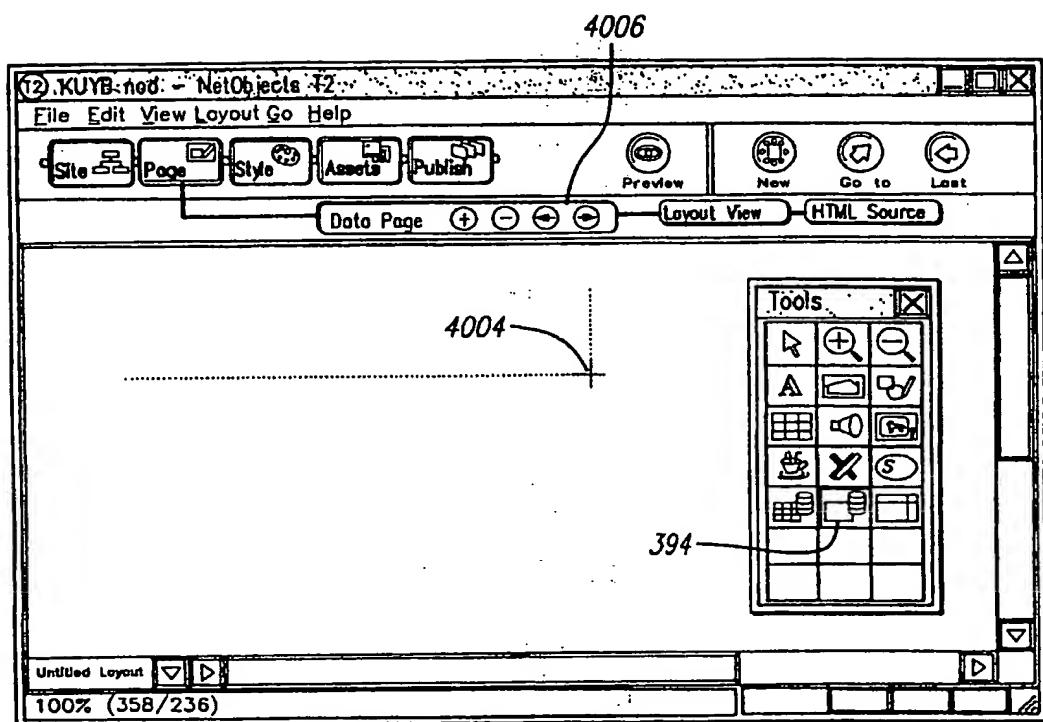


FIG. 39

SUBSTITUTE SHEET (RULE 26)

FIG. 40



SUBSTITUTE SHEET (RULE 26)

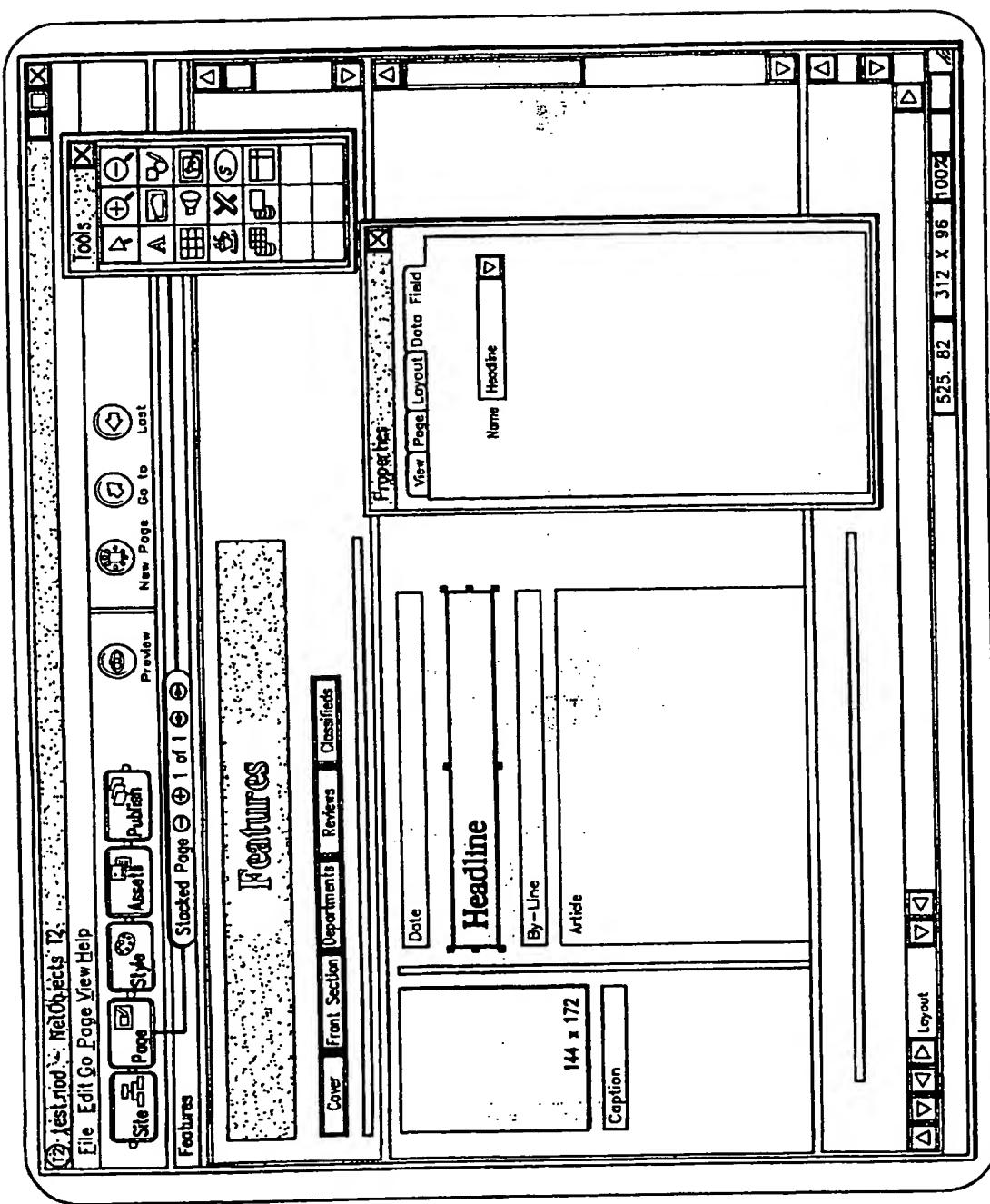


FIG. 41

SUBSTITUTE SHEET (RULE 26)